THE

physical therapy REVIEW

Second Congress
World Confederation for Physical Therapy
Hotel Statler, New York City
June 17 - 23, 1956

The Scope of Responsibilities of the Physical Therapist
— TAYLOR

Influence of Method on Estimates of Normal Knee Extensor Force among Normal and Postpolio Children
— BEASLEY

The Physiologic Basis of Electrodiagnosis
— VOGEL, WEINSTEIN, DELAGI, and ABRAMSON

Graded Functional Exercises: For Leg Muscles — HOPKINS

Physical Therapy in Community Agencies
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Volume 36 - Number 1 **January 1956**

PUBLISHED MONTHLY BY
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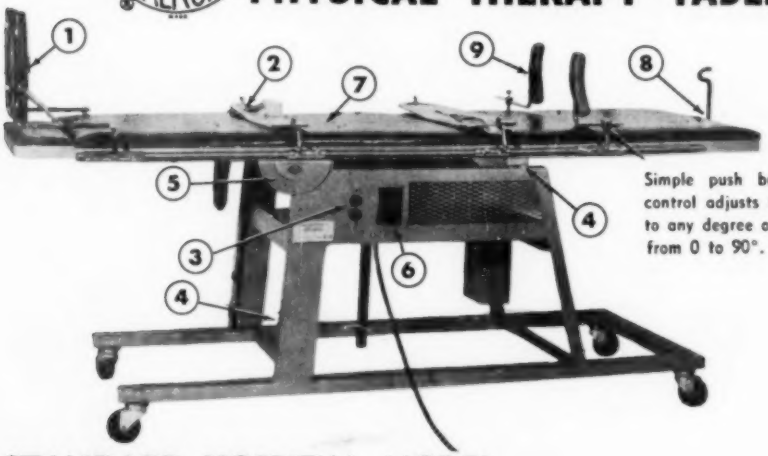

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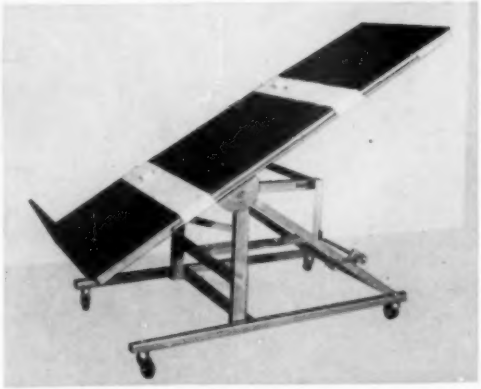

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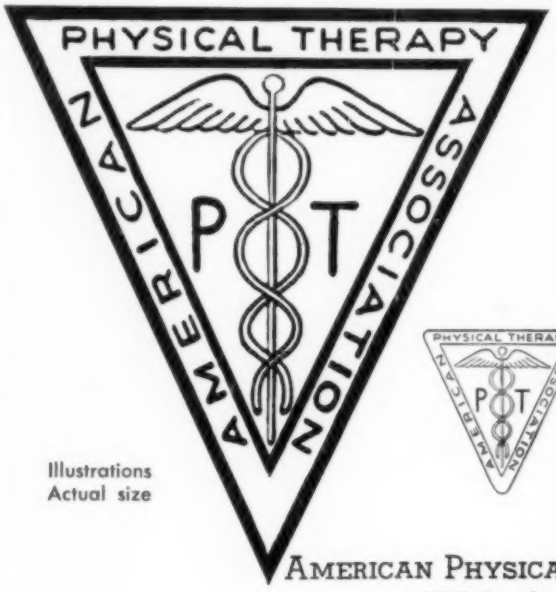

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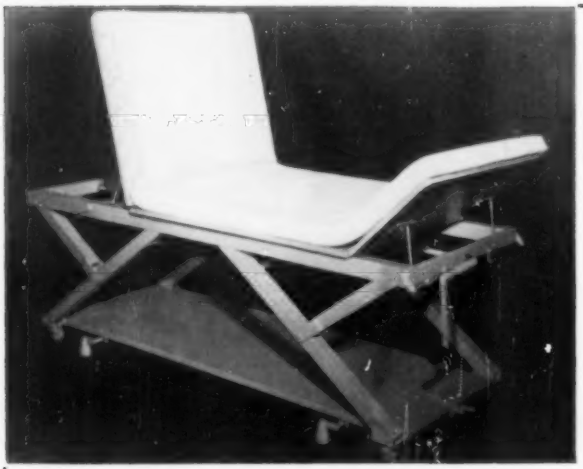

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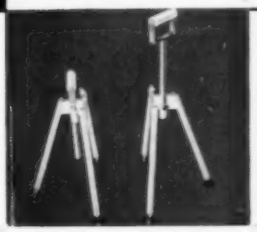

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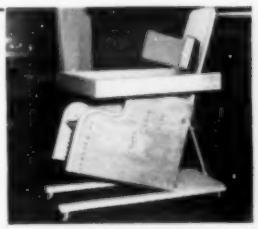

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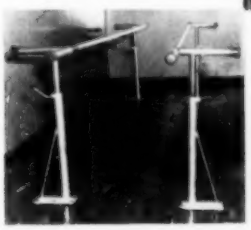

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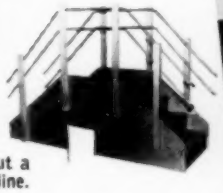

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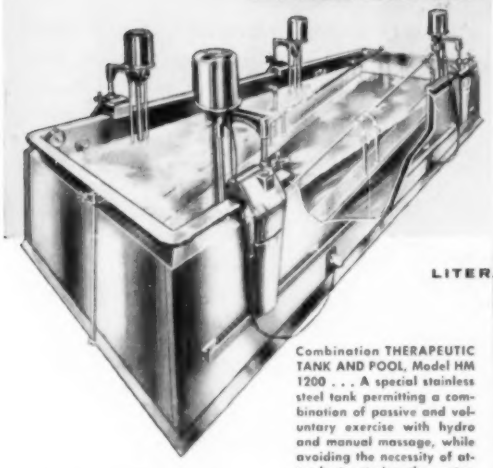

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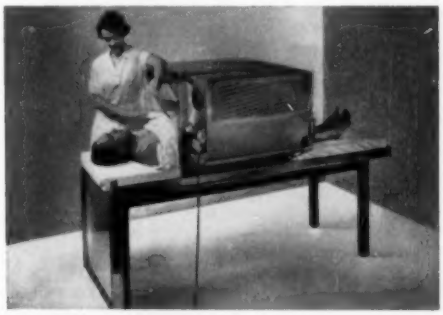

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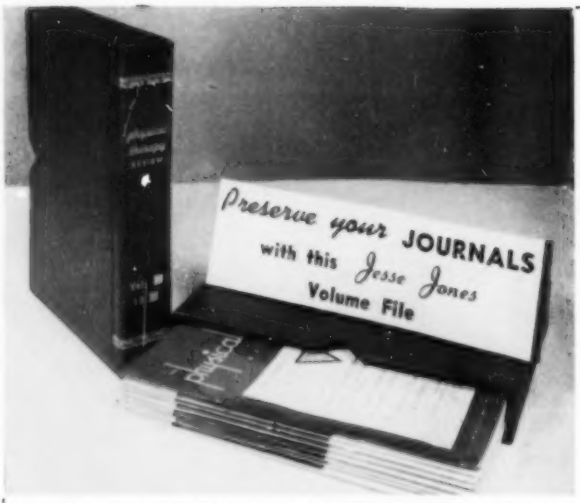

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Since then I have, however, worked at it rather diligently. I can't guess how many hundreds of hours I have devoted to it, nor how much actual money it has cost me. I find, however, that I am indeed very gratified, that perhaps it has added to my self-respect because I am doing a job without expectancy of a reward. It has helped me to better understand the reason why many fine Physical Therapists so devote themselves to their jobs and to their patients, often under adverse conditions, and by no means rewarded in their pay envelopes.

Incidentally, to those of you who have any free time, the medical society in your county will welcome your services this coming year in many of the fund-raising campaigns for medical research and you are the kind of people who best understand the need for such work.

———o———

It is now nearly Christmas as I prepare this copy for printing in your January issue. Of course, business has been good. It's been tremendous all year and I thank all of you for the opportunity of presenting my products for your consideration. But most of all, I am thankful for the very many warm friendships I have among the Physical Therapists throughout the United States. May this year bring many wonderful experiences, prosperity, and contentment to each of you.

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*The Scope of Responsibilities of the Physical Therapist**

Eugene J. Taylor, M.S.

One of the great achievements since the American Physical Therapy Association held its first annual conference 32 years ago is the improved health status of the people of the United States and the other developed parts of the world.

It has been estimated from fossil findings that in prehistoric times, the average man lived about 18 years, his life usually terminating in violent death. This had advanced to around 25 by the time of the ancient Romans. At the turn of the century, it had reached 49, by 1950, 67, and we are now on the threshold of the legendary three-score-and-ten.

As a result, we have in the United States today some 28,000,000 persons who suffer from chronic disease, and chronic disability has become our major medical problem. In 1900 only 4 per cent of the population of the United States was over 65 years of age. But in 1950 the percentage had reached 8 per cent and it has been predicted that by 1975, 29,000,000 Americans or 16 per cent of our population will be over 65 years of age.

This phenomenon of an aging population and its resultant increase in the extent of physical disability has great significance for physical therapy. Unfortunately, many of our chronically disabled have conditions in which definitive medical care can no longer assist them. What they need is a dynamic coordinated program of rehabilitation which will teach them to live as effectively as possible within the limits of their disabilities, but to the hilt of their capabilities, a program in which physical therapy is the foundation or cornerstone.

Today, the prospects for increased rehabilitation services for our nation's 2,000,000 severely disabled are the brightest they have ever been because of the legislation enacted in 1954 which is greatly expanding our Federal-State vocational rehabilitation services. With the availability of additional funds for services and for the training of personnel and expansion of facilities, we are hopeful that the approximately 58,000 persons now rehabilitated into employment annually will be increased to 200,000 a year by 1959.

This legislation has particular significance for physical therapy, for if the goal of 200,000 cases rehabilitated under the Federal-State program of vocational rehabilitation is to be achieved, there must be a substantial expansion of all of the components of rehabilitation, such as physical therapy. One of the important aspects of the training provisions of the new legislation is that its objectives are not limited to increasing both the quality and amount of professional training provided for rehabilitation counsellors or others who may, following such training, become directly employed in the Federal-State vocational rehabilitation program. It recognizes that to

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Long term-associate of Dr. Howard A. Rusk, member of the Editorial Staff, *The New York Times*; Assistant Professor at New York University College of Medicine; Consultant to the Office of Vocational Rehabilitation; and volunteer Public Relations Consultant to the American Physical Therapy Association. Mr. Taylor has attended all but one of the past six annual conferences of the American Physical Therapy Association and attended the First World Congress of the World Confederation for Physical Therapy in London.

* Opening adddress Annual Conference American Physical Therapy Association, St. Louis, June 1955.

achieve the objective of increased vocational rehabilitation the national manpower supply of all categories of workers in the field of rehabilitation must be increased. Already this program has given some assistance to increasing the critically short national supply of qualified physical therapists, and we can expect as it proceeds that greater emphasis will be laid on physical therapy training in the future.

The increasing need for more rehabilitation services and consequently more physical therapy services is not limited, however, to those persons with static physical disabilities who are eligible for the services under the vocational rehabilitation program. If we are to make any real headway in reducing the toll of physical disability in our nation, there must also be increased emphasis on physical therapy and related services in the general hospitals of our country so that the physical, social, and economic effects of both acute and chronic diseases and of trauma can be prevented or alleviated.

Never before in history have the opportunities for restoration of the disabled and the prevention of permanent physical disability been so great. Today we can approach with confidence many disabling and acute conditions which, even but a few years ago, were generally accepted as hopeless.

But at the same time, never before in history has the scope of responsibilities of the physical therapist been so great. For the sake of convenience, let us divide these responsibilities into four main but not mutually exclusive categories, the first of which let us call *technical responsibilities*.

TECHNICAL RESPONSIBILITIES

As a member of a profession and discipline, each physical therapist bears a responsibility for his or her own professional growth and development in keeping fully aware of the technical developments of this profession. With such an alert and dynamic professional organization as is yours, with such a zealous membership, and with such a well-edited professional publication as the *Pysical Therapy Review*, this responsibility of keeping abreast of new technical developments of your profession is probably the most easily met of the physical therapist's responsibilities.

CLINICAL RESPONSIBILITIES

The second of these responsibilities, which we will call the *clinical*, involves a sound professional philosophy, a concept of service, and a high degree of success in interpersonal relationships. It is, therefore, somewhat more difficult to meet than your technical responsibilities. As the various disciplines of medicine, physical therapy, occupational therapy, speech and hearing therapy, nursing, prosthetics, psychology, counselling and job placement have been integrated into the process we term rehabilitation, total patient care, or comprehensive care, the physical therapist is no longer able to limit his or her role to the modalities of physical medicine, therapeutic exercise or the activities of daily living, but must recognize that the object of treatment is the patient and his ability to meet the total needs of his environment. The physical therapist must remember that the stretching of the muscle, the gain in joint range of motion, the improvement of muscle strength, and the gains in activities of daily living skills, important as they are in themselves, are but the means to an end—an end and objective of maximum ability of the patient to utilize fully all of his potentials in meeting the demands of his total environment. When the physical therapist reaches the point of full acceptance and practice of this philosophy, he or she then ceases to be a technician and becomes a therapist in the true sense of the word.

PROFESSIONAL RESPONSIBILITIES

The third of the responsibilities of a physical therapist we may term the professional responsibilities. These encompass your responsibilities to the profession you have aptly chosen to call a "proud profession." Here is involved your participation in your professional organization and relationships with other professions, not so much for what you personally can immediately gain from such participation, but rather what you can give of yourself, your skills and your experience to strengthen the understanding and status of your profession. Major among a number of related responsibilities in this category are recruitment and training. Today, with 6,700 qualified physical therapists in your ranks, you can be justly proud of the growth of your profession. But despite the significant contributions to recruitment and training made by your professional organization and its 58 chapters, by the 34 approved schools and by each of you as members of your profession, your services have created demands for additional service which have far outstripped the tremendous manpower gains made in your profession during the past decade. Despite new schools and increased num-

bers of graduates each year, today there are an estimated 2,500 physical therapy vacancies in hospitals, clinics, agencies, and organizations and this shortage is expected to increase to 5,000 by 1959.

As chairman of a recently appointed Subcommittee of the Health Resources Advisory Committee, Office of Defense Mobilization, to study manpower problems of paramedical personnel concerned with rehabilitation and care of the chronically ill, I have been, as has been Dr. Catherine Worthingham and other members of our Subcommittee, particularly concerned and aware of these personnel shortages. Perhaps the more heartening aspect of our Subcommittee's findings to date to Miss Worthingham, myself, and others particularly interested in physical therapy, is the growing concern of other professions, agencies, and the public over the personnel shortages that exist in physical therapy.

Our studies have tended also to more and more confirm that the American Physical Therapy Association probably has the most knowledge and understanding of the personnel problems of its profession and the most active and effective recruitment programs, both at the national and chapter levels, of any of the paramedical professional organizations. Even this is not enough, however, for as you individually have contributed to the creation of the problem in your effectiveness in meeting your technical and clinical responsibilities, it becomes your professional responsibility to solve this problem.

These three previous responsibilities I have discussed—technical, clinical and professional—are responsibilities to which I am sure that each of you has given much thought. There is a final and broad category of responsibility with which I am sure many of you have been concerned as individuals, but may not have identified formally as a responsibility in terms of physical therapy. That is what I choose to call your international citizenship responsibilities.

INTERNATIONAL CITIZENSHIP RESPONSIBILITIES

As I talk with you here this afternoon, President Eisenhower is addressing the 10th Anniversary Meeting of the United Nations in San Francisco. I do not, of course, know the statements which he will make at this extremely significant meeting. I would venture to suggest, however, that as you read the text of his address in the newspapers this evening or tomorrow morning, if you would automatically substitute the phrase "American Physical Therapy Association" each time the President uses the phrase "The United States of America" and substitute the phrase "World Confederation for Physical Therapy" each time the President uses the phrase "the United Nations" you would see quite clearly your international citizenship responsibilities as a physical therapist.

The tremendous growth of professional and public interest in physical therapy and rehabilitation that has characterized our own nation in the past fifteen years, has not been limited to the United States, Canada, Great Britain, and the Northern European nations who are faced by a rising incidence of chronic disability resulting from an extension of the life span. It is also found in those less-favored nations of the world. New centers and programs of service are starting up throughout the world—in India, Brazil, Lebanon, Korea, Egypt, Indonesia, Liberia. In some nations these services are provided by voluntary organizations, many of which are national affiliates of the International Society for the Welfare of Cripples. In others the national or local govenments have built the facilities and operate the programs. Many have been assisted by a variety of international official agencies, such as the United Nations, World Health Organization, and the United Nations-Children's Emergency Fund; others have been aided by our own United States official programs such as the Foreign Operations Administration; still others have found help from the Rockefeller Foundation, W. B. Kellogg Foundation, World Veterans Foundation and other private or voluntary groups.

But all of them have several things in common and among these is the recognition that physical therapy is the foundation of physical rehabilitation and the subsequent rehabilitation processes. Because of this, you, as a physical therapist, have a right to be just as proud of the role your profession and particularly American physical therapists have and are playing in these developments.

Next June, one year from now, when I hope all of us meet at the Second World Congress of the World Confederation for Physical Therapy in New York, you will find Miss Mildred Elson presiding as President of the World Confederation for Physical Therapy.

Your President has told you of the international distribution of the *Physical Therapy Review*. In the current issue you have read how two members of your profession are assisting in the care and rehabilitation of hundreds of Korean war casualties.

Many of your associates, such as Helen Kaiser, Ruth Whittemore, Signe Brunstrom, Ethel Breis-

meister and Arthur Brown in Greece, Dorothy Voss in Egypt, Priscilla Jusino in Cuba, Teresa Anastasia in Italy and the founder of your Association, Mary McMillan in China, have played pioneer roles in developing physical therapy in these nations.

Others such as Catherine Worthingham in Lebanon, Mildred Elson in Haiti, and Hilda Case in Finland, Alice Plastridge Converse in Belgium, and Elizabeth Zausmer in Germany have served as on-the-spot consultants in advising on the development of services.

At the 1951 Conference of the International Poliomyelitis Congress in Copenhagen, Lucille Daniels, Marion Williams, Helen Vaughn and Hazel Stephens presented daily demonstrations of physical therapy in the treatment of poliomyelitis patients. At the 1954 Conference in Rome, similar demonstrations were presented by Miriam Jacobs and Lucy Blair.

Active roles were taken by physical therapists both from the United States and other nations in the Fifth World Congress of the International Society for the Welfare of Cripples in Stockholm in 1951 and the Sixth World Congress in The Hague in 1954.

Outranked in numbers only by the hosts, Great Britain, 45 American physical therapists and a number of other Americans attended the First World Congress of the World Confederation for Physical Therapy in London in 1953.

Students from Colombia, Mexico, Cuba, Thailand, Brazil, Egypt, and around the world have attended our American physical therapy schools and returned home to initiate physical therapy services in their own countries.

These developments over the world did not just happen. Behind them, particularly in the so-called "underdeveloped areas" of the world there is beginning to emerge a new concept of the dignity of man and the value of the worth of the individual that is being symbolized and expressed in the development of rehabilitation services for the handicapped.

Just as our own favorable geographical, political, economic, cultural, and social circumstances have placed the United States into a position of world leadership and responsibility in so many other fields of endeavor, we bear a special responsibility globally in the development of physical therapy and rehabilitation services to the handicapped. But in accepting this responsibility, we are serving more than high idealistic, moral, and humanitarian ends.

Peace is never a product of military force alone. Nearly ten years of the cold war have taught us that the political health of our own nation and of the world depends upon our economic health, and our economic health depends on the physical and mental health of our people.

Casting aside momentarily all humanitarian motives, it is in our own interests to eliminate the conditions that cause disability and poverty for these in turn are the breeding grounds of political unrest. One-third of the world today enjoys fair health standards and fairly long life, but two-thirds of the world's population living in the underdeveloped areas of the world have an average annual income of less than fifty dollars and a life expectancy of less than thirty years.

To the natives working the rice paddies of Asia, the desert lands of the Middle East, or the jungle plantations of Africa, Communism today offers an illusion of a world of plenty, for it capitalizes on their sickness, bitterness, and discontent. Many are beginning to realize that they are the underprivileged members of the tightening circle of the world family.

Today our government and the free world spend billions of dollars for military preparedness and other billions of dollars for programs of economic and technical cooperation through the world and particularly in the Africo-Asian nations which with their tremendous number of population will eventually make the choice of casting their lot and the world's future with either democracy or totalitarianism. But what good is a man as an ally if doubled up with disability, he is unable to stand up and be counted in the militant fight for democracy and freedom?

Unless he can produce, how can he enjoy the fruits of his own labor and become a consumer of the goods which we want to sell him?

Aside from the political and economic significance of improving the health of the people of the world, rehabilitation can also provide the understanding between peoples and nations that is the essential foundation of any political effort toward peace.

Helping to expand rehabilitation services to develop this understanding is your responsibility —the international citizenship responsibility of the physical therapist. It, together with your technical, clinical, and professional responsibilities, is what an English philosopher meant when he said three hundred years ago, "If every man would mend a man, the world would all be mended."

Helping to mend a politically crippled world as well as to heal an orthopedically crippled child is the responsibility of your, the proud profession.

*Influence of Method on Estimates of Normal Knee Extensor Force among Normal and Postpolio Children**

Willis C. Beasley, Ph.D.

Introduction

Problems considered in this paper are broadly applicable to the whole field of clinical muscle testing, with particular reference to manual grading theory and practice. Data, technics and conclusions presented are limited specifically to sequential studies on knee extensor action among normal children and postconvalescent poliomyelitis patients in the 9-12 year age group. The report is limited in order to avoid complex ramifications of problems and data which occur when attention is given to many different muscle groups among normal and weakened subjects through extended age ranges. Materials for analysis were drawn from an extensive investigation, which the author has conducted over a period of eight years. The pattern and sequence of experimental procedure to be described were duplicated concurrently at each phase of the continuing investigation for 38 joint motions of the trunk and extremities. All of this information is being analyzed for the purpose of developing complete and systematic knowledge about forces obtained by different methods on muscular actions that physical therapists are required to evaluate routinely. Attention will be given to the background of the whole investigation as a basis for interpreting the significance of specific results on knee extensor action for clinical muscle testing.

At the beginning of this work in 1945, a comprehensive program was formulated, which has been described in detail elsewhere. The following summary, which will enable readers to understand why particular experimental procedures described in this paper were pursued, recapitulates the original purposes:

1. To develop methods for studying practical aspects of manual muscle testing and estimating in quantitative terms just how effective these established procedures are in rendering an account of muscular strength in the full range of clinical manual muscle testing grades from 'normal' down to 'zero'.

2. To study the effects of body positioning, with and without artificial stabilization, on measurements of muscular forces, and devise adequate methods applicable to both normal and weakened actions.

3. To measure muscular forces by various methods on normal subjects and derive estimates of population averages and variance among different classes of subjects for all muscle actions of primary interest clinically.

4. To obtain similar measurements on poliomyelitis patients at the chronic or postconvalescent stage, and relate the force measurements obtained to manual muscle testing grade evaluations provided by clinical therapists and to measurements on nonclinical normal subjects.

This plan comprised the minimum requirements for an investigation that would provide information essential to designing a useful quantitative system of muscle testing and interpretation, and at the same time reveal wherein manual muscle testing as currently practiced is limited, and the amount of error involved. By interrelating the measurements of forces on normal subjects to those on patients, classified according to manual grade, one could derive realistic calculations showing the actual percentage level ratings that should be applied to each manual grade class for different muscular actions. The objective knowledge thus obtained was sought to enable physical therapists and other workers in related

Aided by grants from the National Foundation for Infantile Paralysis (1945-1951 inclusive). The continuation of analysis and essential studies is being supported by grant B-565, Division of Research Grants, National Institute for Neurological Diseases and Blindness, National Institutes of Health, U. S. Public Health Service.

The author carried on the major portion of this research as Biophysicist, Division of Public Health Methods, U. S. Public Health Service and the National Institutes of Health (1944-1953 inclusive). Since January, 1954, his position is Research Biophysicist in Physical Medicine, Research Foundation of Childrens Hospital, and Director of the Biophysics Research Laboratory, Washington, D. C. and Bethesda, Maryland.

* A preliminary draft of this paper in briefer form was read at the 1955 Conference of the American Physical Therapy Association, St. Louis, Missouri, June 19-25.

fields to select intelligently muscle testing technics that are shown to be adequate for particular clinical problems and to discontinue using those that are demonstrated to be inadequate. The program of work was conducted throughout in direct alignment with these objectives.

I. INSTRUMENTATION AND METHODS

To obtain the information sought in accord with these fundamental objectives, it was obviously necessary to develop special instrumentation adequate to the task, since none existed. There were four requirements, each being regarded as indispensable:

A. In order to evaluate errors and limitations of manual muscle testing, both physical equipment and systematic methods were needed to obtain quantitative measurements of the forces being applied by the physical therapist during manual estimations of particular muscle actions. For this purpose a Manual Force Gage (MFG) was developed, and through the extensive experimental program, adequate methods of testing were likewise developed.

B. In order to measure without limitation the forces of any muscular action regardless of magnitude and independently of the examiner's capacity and skill in applying force, a different device called the Axial Tensiometer Gage (ATG) was developed.

C. In order to record graphically tracings of forces produced during any trial effort, electronic instrumentation was designed and constructed. This provides the means for translating mechanical load applied to the force gages into a linearly correlated and objective tape record, so that time-force relations can be analyzed as desired. The combination of force gages, electronic units, and recording mechanism was named an Electronic Myodynagraph (EMD).

D. In order to study the effects of body positioning and associated biomechanical variables, a special table and attachments, various types of stabilizing harness, and a sturdy rack surrounding the table were developed. The rack, made of ¼" angle iron and T-bars, provides an indispensable facility for attaching the ATG to the subject in the numerous positions required in testing all of the major joint motions.

Each unit of apparatus was redesigned and improved as experimental results over a period of years indicated need for changes. A complete system of quantitative muscle testing and adequate methods for the majority of clinical problems relating to measurements and graphic recording of muscular forces have been standardized. The only joint motions for which adequate experimental data have not been obtained so far in this investigation are those of the fingers and toes, but methods for conducting these tests have been standardized.

The physical characteristics of the EMD and associated equipment will be described and published in the future. A brief description of other essential instruments will aid interpretation of the experimental procedures employed.

Axial Tensiometer Gage

The Axial Tensiometer Gage (ATG) was developed first in conjunction with the electronic units, and was used all along as a reference standard for interpreting results that were being obtained by manually applied force methods. The ATG was progressively improved, and in the final design two units are used. They both have the same characteristics as the unit shown in figure 1, but differ in the thickness of the mounting bar to which strain gages are cemented. The unit designated ATG-1 has a sensitivity range from 0.05 lb. to 400 lb., and ATG-2 is exactly one-tenth as sensitive, having a range from 0.5 lb. to 4,000 lb.

A convenience of these two gages is that the same force-range scales on the EMD can be used with either one, and a simple correction factor X10 applied. This small unit, made of duralumin and weighing only 2.6 oz. without attachments, can be fastened to the subject as required for the many different and necessary approaches in muscle testing. The unit is protected especially well to withstand severe physical abuse to which it is inadvertently subjected in practice, and maintains stable calibration for many months. Several units have been in steady use for six years without significant change in calibration characteristics.

The ATG together with numerous accessories as required by the particular action being tested, as well as by the force magnitude, is adaptable to a wide variety of methods and problems in experimental study of neuromuscular functioning. In fact, through the extensive work done in this investigation an entirely new conception of objectives in clinical muscle testing has been envisioned.

ATG Method

In general, with the ATG method, the *tension impulse curve* (TIC), which is a measure of voluntary motor output, is traced on the record tape, showing the course of isometric tension (IT) with time. The area under this curve, or the

product of average force X time, is an index to the muscular energy expended during contraction. This same value as a physical unit measures the *tension impulse* (TI) or *momentum* of the force. These two physical units have the same mathematical definition in mechanics. The *form* of TIC indicates directly the character of motor tetanus produced voluntarily, and therefore serves as an index for evaluating normality of neuromuscular functioning.

At any desired moment during active contraction, the examiner may apply passive stretch to the contracting muscles mechanically by means of a properly arranged pulley and steel cable system provided with mechanical stops to control angle. This method also controls the amount of stretch superimposed. When this is done, the *myotatic impulse force* (MIF) which is the result of passive stretch appears superimposed upon TIC. The illustration in figure 2 is an example of a 10-second TIC for knee extension at 60° and at 75° knee flexion, and also a TIC with MIF superimposed three seconds after the beginning of IT at 60°, the stretch being applied through 15° of arc from 60° to 75°.

In curve D, the sequence of events during a 10-second tension-stretch trial is identified as follows: (a) relay closes starting record tape; (a-b) time during which knee extension force rises to maximum IT at 60° position in arc; (b-c) time during which maximum effort at 60° is maintained; (c-d) brief period of approximately 0.4 second during which passive stretch is applied and MIF is produced; (d-e) period of rapid reflex inhibition of the myotatic response; (e-f) continued maintenance of maximum effort at the 75° arc position. Throughout the whole period from b to f, the subject is voluntarily maintaining maximum effort as in trials A and B when no passive stretch is applied.

It is important as a basis for interpreting data discussed later to note two features of these illustrations. First, the level of isometric tension (IT) maintained at 60° knee flexion is not significantly different from the level at the 75° position. Movement of the leg through this 15° of arc does not in itself produce any change in force level due to purely mechanical factors of the angulation involved. Second, myotatic impulse force (MIF) is a *transient* force of brief duration. It is synchronous with the duration of stretch, immediately inhibited at cessation of passive stretch. The level of tension impulse curve (TIC) is resumed at once following inhibition of myotatic impulse force (MIF). This is a typical form of the response in normal subjects,

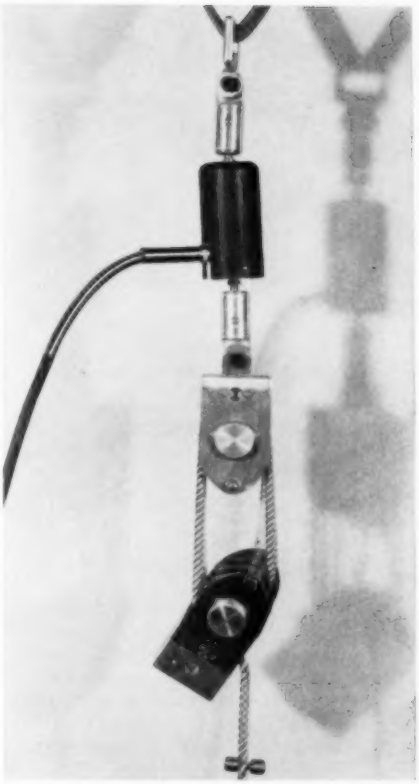

Figure 1. Axial Tensiometer Gage (ATG) with two ball and socket couplings. The ball bearing block and tackle unit weighs 2.8 lb., is made of duralumin, and gives a mechanical advantage of 6:1 to the experimenter in stretching contracting muscles. The mechanical stop at the bottom is used to control joint range during the stretch.

but it undergoes many variations in poliomyelitis and other neuromuscular dysfunctions. In normal subjects, there is seldom a significant degree of *after-force* resulting from after-discharge or delayed internuncial neuron excitation. It is this process, however, which is modified in neuromuscular dysfunction and numerous variations of the normal pattern can be recorded by the ATG method as described here.

These curves illustrate also the recordings obtained for normal children as discussed later relative to the studies on knee extensor forces with the ATG method. In the analysis of records

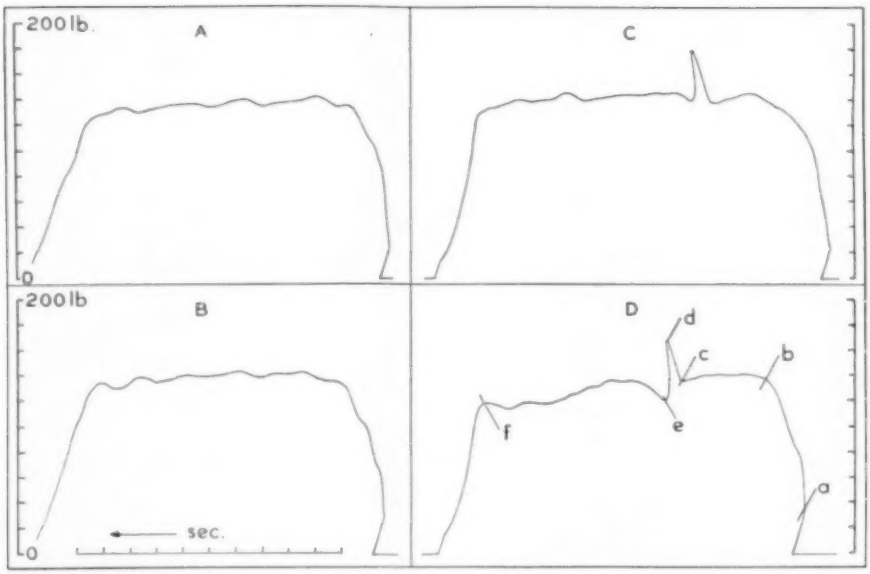

Figure 2. A and B are tension impulse curves (TIC), with the knee joint flexed 60° and 75° respectively. C and D show the myotatic impulse curve (MIC) superimposed. In this example of knee extensor force produced by a boy of 12 years, isometric tension (IT) averages 140 lb. and MIF rises to 180 lb., an increment of 40 lb. or 29% increase in muscular tension resulting from activation of the stretch reflex system.

for the present study, the *average value* of tension impulse curve (TIC) and the *peak value* of myotatic impulse force (MIF) were tabulated and are designated as isometric tension (IT) and myotatic impulse forces (MIF) respectively.

Functionally, TIC is a measure of voluntary motor output. The *level* of TIC is an index to the total number and frequency of discharge of lower motor units activated by voluntary innervation during a trial effort, as well as an indication of the 'qualitative' property of muscle fibers to produce tension. The *pattern* of TIC indicates the degree of temporal continuity of the total process involved in innervation and motor functioning. The magnitude of MIF reflects the amount of additional innervation and motor response (tension) produced by stimulating the stretch afferents through the action of applied passive stretch. It is therefore a measure of reflex activation of lower motor neuron units dynamically added to the concurrent voluntary activity.

Development of Manual Force Gage

Development of a Manual Force Gage (MFG) adequate to the objectives was a major problem, and consumed three years of methodical experimentation and revision of designs. Essentially three different types, as illustrated in figure 3, were subjected to practical testing procedures on normal school children and adults.

Accurate calibration procedures were always utilized, regardless of the response characteristics of the MFG, and therefore the measurements in themselves validly represented the forces applied by the physical therapist for all tests as conducted. The linearity and response range of the MFG's were both improved along with other features. The major problem, however, was not physical performance of the device, but rather (1) whether the design enabled the physical therapist to apply her maximum force using the MFG as compared with the bare hand, and (2) whether the application of force remained at a right angle to the long axis of the subject's extremity—an essential requirement for a valid force measurement. Revision of designs was centered upon achieving a solution to these problems.

Figure 3. Three types of manual force gages (MFG) employed in experimental studies of physical therapists' abilities to apply force in muscle testing procedures. Type A (left) used in 1946; type B (center) used in 1947; type C (right) used in 1948 and subsequently.

MFG-type A

The MFG-type A was made of polystyrene plastic, weighed only 3.5 oz., and was designed to be worn in the palm of the hand in order to imitate closely the approach most generally used by physical therapists in conducting manual muscle tests clinically. The base was rounded to fit comfortably into the physical therapist's hand; the dome was likewise rounded and padded with sponge rubber to distribute pressure in application against the subject's body surface. This MFG was subjected to thorough trial in 1946, and was found to be wholly inadequate. The research therapist using it could not apply force effectively, the major limiting factor being the wrist flexion and shoulder internal rotation strength, which were the primary determinants in the application of force using this approach. Experience with the type-A gage pointed up sharply the specific limitations of this approach in applying force manually, as a review of the data will show.

MFG-type B

The MFG-type B, which was subjected to thorough practical trial in 1947, was designed with a flat base so it could be pressed firmly against the heel of the physical therapist's hand, with the wrist held in approximately 75° extension. The approach was to apply force in line with the long axis of the physical therapist's forearm, to employ elbow extensor thrust motion as near to full extension as the testing approach permitted, and to utilize combined action of the latissimus dorsi and pectoral muscles in sustaining the applied load. The physical therapist demonstrated greatly improved ability in applying force with this MFG and altered management of her own body. This MFG was fitted with a flat pressure plate, covered with a firm rubber cap which permitted applying force securely and comfortably on the subject's body surface at all locations. The design was not satisfactory because the physical therapist could not maintain the applied force at a right angle to the subject's extremity, resulting in erroneously low or high force readings. Otherwise, this MFG was a decided step forward in the right direction.

MFG-type C

Defects noted in the design of MFG-type B were corrected in 1948 with the MFG-type C, which was used without modification in all subsequent applications of the MFG method. As shown in figure 3, the type C gage is worn in the same manner as type B. The major change, aside from the shape of the housing itself and other engineering improvements, was to remove the pressure disc and substitute a small cylindrical shaft, which can be seen projecting through the hand strap. This shaft, which projects 5/16″ above the MFG face and is ½″ diameter, fits loosely into a circular slot 3/32″ deep in a fiber strap mounted on the surface of any one of many different pressure plates, varying in size and form. A variety of these plates is shown in figure 4. They are designed to press firmly and comfortably on body contours to which force is applied during a test trial. The purpose of the shaft-receptacle relation is to provide a strictly mechanical situation that requires the therapist to apply force at a right angle to the extremity and *maintain* this relation during a test motion. A deviation of 10° from perpendicularity results in the shaft slipping out of the receptacle thereby

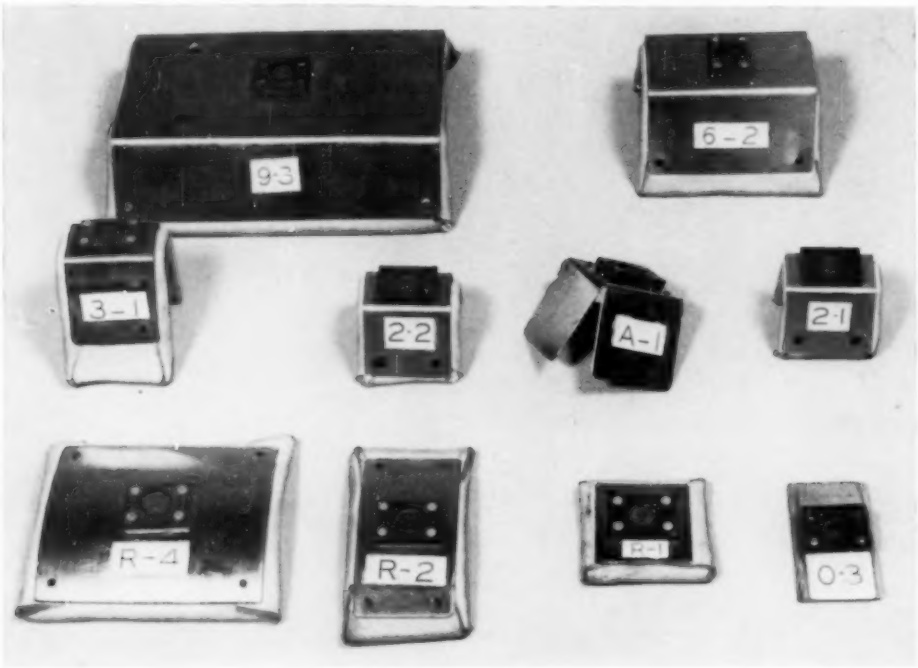

Figure 4. Varieties of pressure distributing plates ancillary to MFG-type C. Explanation of use in text.

stopping the test. Dexterous physical therapists readily learn to manage this method efficiently.

II. Subjects and Sequence of Studies

A. Selection of Normal Subjects

Each group of subjects upon which the present comparisons are based comprised nearly all of the children 9-12 years available each year at the Bethesda Elementary School (and the Bradley School, in 1949). Since about 70 per cent of both populations are not native to Montgomery County, Maryland, but come from all parts of the United States, the sample may be regarded as diversified, even if not random in a strict statistical sense. Statistical 'randomness' explicitly means assigning random numbers by unbiased procedure to a file of objects or items, and drawing a sample as arbitrarily dictated by a table of numbers as arranged in mathematically random order. This procedure minimizes the chance of bias influencing the characteristics of the sample in relation to the population from which the sample is drawn. When samples were drawn from this school population for unit studies, a random method with reference to alphabetic listing of pupils was used. The groups ranged in size from 100 to 296 for this restricted age range in the different years, and hence provided a statistically sound basis for estimating population means and variance for the type population studied by the different methods.

B. Selection of Method

The following summary gives a brief characterization of the methods compared in this series of studies:

1. Body positioning

During 1946, 1947, and 1948, the problem to be solved was to develop a method of measuring the amount of force applied manually by a physical therapist in producing 'yield' or joint motion (usual muscle testing technic) using body positioning in accordance with standard clinical procedures without any form of artificial stabilization. The methods of body positioning and

TABLE I

Results for Three Types Manual Force Gage
Knee Extension without Pelvic Strap Stabilization
Boys & Girls, 9-12 years

Body & Arc Position			Mean : $\bar{x}$			Std. Dev. : s		
			1946	1947	1948	1946	1947	1948
Sitting	15-30°	$\bar{x}_a$	40.36	41.14	55.15	10.42	9.49	11.73
Supine	"	$\bar{x}_b$	- -	- -	54.25	- -	- -	11.19
Sitting	75-90°	$\bar{x}_c$	44.05	46.61	59.67	9.86	8.56	11.90
Supine	"	$\bar{x}_d$	46.66	46.70	61.03	10.50	10.32	12.22
Prone	"	$\bar{x}_e$	- -	35.81	- -	- -	8.81	- -
Tests - N			820	798	600	820	798	600
Subjects			205	133	100	205	133	100
Force Gage Type			A	B	C	A	B	C

In 1946, the N for tests is 2 maximum effort trials each right and left; in 1947 and 1948, N is 3 each, right and left.

other aspects of procedure for testing the various actions duplicated as nearly as possible the standard technics employed rather universally in the United States, specifically as described in the Muscle Testing Manual by Daniels, Williams, and Worthingham. The reason for adopting this approach was to put on record the force levels obtained and note the problems arising from using these methods. A major task for the investigation initially was to develop a manual force gage design that would enable the physical therapist to apply force as adequately as strength, body weight, and positioning approach permitted. Many experiments were conducted to find out whether one position or another favored the physical therapist and/or the subject, and to select those that gave the most favorable result, i.e., highest forces. It was recognized almost immediately that the usual muscle testing positions were inadequate and that when using such methods one could not obtain measurements that would truly represent normal maximum forces for the action. Nevertheless, data were collected systematically and continuously until sufficient evidence was established to show the level of forces obtained by these methods. It was fully expected that in the later phases of the work, with more appropriate methods, large differences would be shown depending on method used.

2. Stabilization of subject and comparability of physical therapists

The conclusion was reached early in 1948 that the Type C manual force gage permitted the physical therapist to apply a maximum force, and no further improvement in this area was needed. Similarly, these three years of work brought out strikingly the total inadequacy of the subject's body mass and counterforces to stabilize against primary joint motions for most of the actions being studied. Consequently, during this year detailed attention was given to developing technics for artificial stabilization, which have proved to be essential for valid tests with normal and near-normal subjects. During the latter part of 1948, technics for providing artificial stabilization as required by the many different body positions and muscular forces to be measured were investigated, and standard procedures were completed during the first part of 1949. The problem then was to compare results from these methods with the earlier ones, and add the question as to comparability of results by different physical therapists. Up to this point, all testing was the work of one physical therapist. Obviously, the question as to comparability of different physical therapists had to be answered. This paper presents one set of data on this problem. Other sets

TABLE II

Analysis of Variance for Grouped Means in Table I

Source of Variance	Sums of Squares SS	Degrees of Freedom DF	Variance or Mean Square MS	Variance Ratio F	P%
1946: $\bar{x}_a$, $\bar{x}_c$, $\bar{x}_d$					
Body & arc positions	656	2	328	77.73	$\ll 0.1$
Subjects	10,359	2,457	4.22		
Total	11,015	2,459			
1947: $\bar{x}_a$, $\bar{x}_c$, $\bar{x}_d$, $\bar{x}_e$					
Body & arc positions	4,048	3	1,349	257	$\ll 0.1$
Subjects	16,713	3,188	5.24		
Total	20,761	3,191			
1948: $\bar{x}_a$, $\bar{x}_b$, $\bar{x}_c$, $\bar{x}_d$					
Body & arc positions	1,245	3	415	48	$\ll 0.1$
Subjects	20,719	2,396	8.65		
Total	21,964	2,399			

$\ll$ means *much less than*

of experiments relating to the same question provide still further contributions on this problem.

3. Method for comparison of results

Next, the question remained as to how both sets of results compared to forces measured by a tensiometer method (ATG) that is independent of the physical therapist's ability to apply force, and adequate from the standpoint of all biomechanical features of the method employed. Data resulting from studies with the ATG method serve as a reference for interpreting adequacy or inadequacy of all other variations of method employed in previous years.

4. Equivalent studies on poliomyelitis patients

Concurrently, with the studies on normal children in the public schools, equivalent studies on all actions were being conducted at hospitals on postconvalescent poliomyelitis patients. On these patients, clinical physical therapists provided clinical manual muscle testing grades, and a specially trained physical therapist conducted the quantitative muscle testing by the writer's methods on the same patients. In the present report, a comparison of forces obtained by the various methods employed is made between patients having the manual grade 'normal' and 'good' and normal children. Theoretically, asking physical therapists to position a patient on a treatment table in accordance with prescribed procedure, without any special provisions for biomechanical stabilization, and rendering a judgment as to whether the action is 'normal' constitutes a method of gauging normality. The error involved in this method is evaluated quantitatively by the results obtained with the other methods.

This sequence of studies represents the progress of the whole investigation toward establishing a basis for interpreting the degree of error in clinical manual muscle test grading, as well as illustrating the manner in which valid and adequate procedures evolved from experimental study.

III. TECHNICS AND RESULTS: 1946-1948

During 1946 to 1948, the action knee extension was studied in accordance with manual muscle testing positions, without any form of artificial stabilization. No illustration is provided for these positions, since they are readily visualized. Five positions were used:

1. and 2. Subject in sitting position at end of treatment table, with a sponge rubber pad near the knee joint and under the tendons of the hamstrings to avoid counterpressure pain. With complete extension referred to as 0, the test range was either 15-30° knee flexion, or 75-90° knee flexion, as judged by eye.

3. and 4. Subject supine lying with knees

flexed over end of table, the test range being either 15-30° or 75-90°.

5. Prone lying, both hip joints extended, test range being 75-90° knee flexion.

In all positions the subject was permitted to grasp the edge of the table to provide some degree of counterpoise for the primary action. During this period, also, experimentation was being pursued to standardize methods for conducting adequate tests with the tensiometer (ATG) method.

Statistical reductions for the distributions of measurements for knee extensor forces obtained during the three years for the five test positions and for three different types of manual force gage are shown in table I. Significance tests for the data are detailed in tables II, III, and IV. Many detailed comparisons are readily available from these four tables. We shall note only a few significant points that relate to the major interpretations. From the standpoint of testing methodology, there were actually five sources of variance: type of manual force gage; subjects; test range in the arc of motion; position (sitting, supine, prone); and the therapist. Finally, on a comparative basis, a conclusion was derived regarding which method provided the best estimate of normal knee extensor force among children 9-12 years of age.

In table I it is noted that the level of force for all positions (means) ranges from a minimum of 35.81 lb. to a maximum of 46.70 lb. during 1946 and 1947 with type A and B gages, but the level of all means rose sharply to a range from 54.25 lb. to 61.03 lb. in 1948 with type C gage, a highly significant change. Within each year, there was always a highly significant differentiation of results due to body and arc positions (F tests, Table II). A detailed breakdown of pair by pair comparisons of body and arc positions within years (t tests, Table III) and between years for the same position (t tests, Table IV) indicates more specifically that some positions are more differentiated than others. In all comparisons, the supine 75-90° knee flexion was superior, and the prone position gave the lowest level of force. The most conspicuous effect is associated with the *method*—that is, the 1948 series with the type C gage. This effect in itself was so large that the statistical question of significance loses meaning. The absence of a consistent significance between the tests for the same body and arc positions between years for 1946 and 1947 was difficult to understand, because the physical therapist was fully convinced that she could apply force more effectively and more consistently at a right angle with the type B gage than she had been able to do with the type A gage. Later results helped explain this puzzling result, as will be noted.

TABLE III

Significance (t-Tests) between Selected Pairs of Means (from Table I) with Reference to Body & Arc Positions

Pairs of Means (Table I)	Diff. (lb.)	t*	P%
1946:			
$\bar{x}_c - \bar{x}_a$	3.69	7.35	$\ll 0.1$
$\bar{x}_d - \bar{x}_c$	2.61	5.19	$\ll 0.1$
$\bar{x}_d - \bar{x}_a$	6.30	12.19	$\ll 0.1$
1947:			
$\bar{x}_d - \bar{x}_c$	0.09	0.17	> 80.0
$\bar{x}_c - \bar{x}_a$	5.47	12.12	$\ll 0.1$
$\bar{x}_a - \bar{x}_e$	5.33	12.04	$\ll 0.1$
1948:			
$\bar{x}_c - \bar{x}_a$	4.52	6.63	$\ll 0.1$
$\bar{x}_d - \bar{x}_c$	1.36	1.95	> 5.0 < 10.0
$\bar{x}_a - \bar{x}_b$	0.90	1.35	> 10.0 < 20.0

* Degrees of freedom are ∞ for each test. P% (two-tail tests) = 2Q x 100 (Pearson & Hartley).

(∞ infinity sign)

$\ll$ means *much less than*

$>$ means *greater than*

$<$ means *less than*

IV. TECHNICS AND DATA, TYPE C (MFG) WITH STABILIZATION, 1949-1950

A. Method

After having fully standardized stabilization technics during 1948 and early in 1949, attention was given to the problem of comparability of physical therapists with the improved MFG methods. Consequently, during 1949 and 1950, the supine position was accepted as standard, since it had been proved the most adequate.

The standard technic with artificial stabilization used in all studies after January 1949 for subjects, both normal and clinical, who could be tested in the supine position, is shown in figure 5. The wide band and surface pad were strapped firmly over the region of the pelvis sufficiently tight to prevent elevation from the table during maximum effort. The rounded end-block under

the thigh distributed pressure over a wide area and prevented pain. The test arc was midrange, estimated roughly to be from 60-75° of knee flexion as judged by eye. The pressure cuff was placed proximate to the ankle joint. The therapist assumed a stable stance, counterpulled with her free hand, and brought her full body weight to bear, with arm straight and stiff.

The arc range 60-75° was chosen as standard for two reasons: first, because the therapist can control the application of force more effectively and also can apply a greater amount of force than at the 75-90° range; second, there is less variation in maximum effort force for knee extensor action with a change of knee joint angle amounting to 20° or so through the range 60-75° (see Figure 8) than for any other similar range in the arc of motion. Therefore, measurements made in the preferred range of 60-75° are less subject to variance arising from error in the control of angle.

B. Training and comparability of physical therapists

At the beginning of 1949, three additional therapists were added to the staff and were trained thoroughly for a period of three months with daily practice on 38 joint motions of the trunk and extremities. Practice subjects were children and adults. During April, May and June, all physical therapists conducted a program of testing in two public schools in Bethesda. The 38 joint motions were divided into two sets, and each child was tested for one set on any one day. Each physical therapist worked with a different sample of subjects. Each set of tests required about one-half hour.

During this period, each physical therapist carried out the full program of testing on a staggered sample of children at each age level from 6 to 12 years.

Statistical reductions of the data for 1949 and 1950 for the knee extensor tests are assembled in table V. Significance evaluations of the data are given in tables VI and VII. The most striking trend was the continuous increase in the estimates of normal knee extensor force with continued experience by physical therapists A and B, using type C gage method with pelvic strap stabilization. Also, physical therapists B_1, C_1, and D_1 in their first rounds of tests, without previous experience, obtained force levels that averaged about 60 lb. There was significant differentiation between these three physical therapists (F test, Table VI), but the pair by pair comparisons (t test, Table VII) show that this differentiation was

TABLE IV

Significance (t-Tests) between Selected Pairs of Means (from Table I) with Reference to Type Manual Force Gage and Year Used

Body & Arc Position	Means by Year & Type Gage**	Diff. (lb.)	t*	P%
Sitting 15-30° ($\bar{x}_a$)	'47 - '46	0.78	1.58	< 20.0 > 10.0
	'48 - '47	14.01	24.01	≪ 0.1
Sitting 75-90° ($\bar{x}_c$)	'47 - '46	2.56	5.58	≪ 0.1
	'48 - '47	13.06	22.82	≪ 0.1
Supine 75-90° ($\bar{x}_d$)	'47 - '46	0.04	0.77	< 50.0 > 20.0
	'48 - '47	14.33	23.18	≪ 0.1

** Type gage is associated with year used (Table I).

* Degrees of freedom are ∞ for each test.

P% (two-tail test) = 2Q x 100 (Pearson & Hartley).

(∞ infinity sign)

< means *less than*

> means *greater than*

≪ means *much less than*

Figure 5. Manual force gage (MFG-type C) method with pelvic strap stabilization used in 1949 and thereafter. The electronic myodynagraph (EMD), which records automatically the force reaction between therapist and subject, is seen in the background.

due entirely to physical therapist B_1 who obtained results that were significantly higher than those obtained by physical therapists C_1 and D_1, the latter two not being significantly different from each other.

It would have been of interest if all four physical therapists could have continued their work another year, but funds were available to retain only therapists A and B. Physical therapist A_1, who had conducted all of the previous testing, in her first round of tests with the stabilization method obtained a mean force level of 75.33 lb., and therapist B_2 obtained an average level of 72.92 lb., showing highly significant increases above previous estimates by each of these two. In the final rounds of tests by these two physical therapists in 1950, A_2 attained an average of 81.48 lb. and B_3 an average of 80.17 lb. These four rounds of tests, two by each physical therapist, are significantly differentiated (F test, Table VI), and all of the detailed comparisons between these two therapists, and between themselves on successive rounds of tests (t test, Table VII) attain statistical significance.

C. Influence of stabilization

The sequence of gains by each physical therapist reflects improvement in ability to apply force by this method, and the high level attained finally likewise demonstrates the effectiveness of the pelvic strap stabilization technic. Inspection of the total frequency distribution of measurements for the A_2 and B_3 rounds of tests, however, leads to the observation that the distributions are negatively skewed, with a limitation imposed upon higher force readings—particularly above the 90 lb. level. This suggests that the pelvic strap stabilization enables the subjects to produce more force than either physical therapist could match by the MFG method.

TABLE V

Comparative Results—Four Therapists
Knee Extension with Pelvic Strap Stabilization
Manual Force Gage, Type C, Arc Range 60-75°, Supine
Boys & Girls, 9-12 Years (1949-50)

Therapist	Subjects	Tests N	Mean $\bar{X}$	Std. Dev. σ	Coeff. V%
A_1	156	936	75.33	18.69	24.80
B_1	174	1,044	62.48	15.60	24.96
C_1	108	648	59.81	16.18	27.05
D_1	106	636	59.03	10.89	18.45
A_2	296	1,776	81.48	12.66	15.54
B_2	164	984	72.92	10.93	14.99
B_3	136	816	80.17	9.48	11.83

N for tests is three maximum effort trials each, right and left.

The rather marked influence of artificial stabilization for this action is shown by the recordings illustrated in figure 6. These two sets of curves are for tests done in immediate succession on the same child. Curves A, B and C, which attain an average level of 46 lb., were taken without the pelvic strap stabilization; curves D, E and F were taken with the standard stabilization method. They attain an average level of 78 lb. It is significant also that curves A, B and C are narrow and show a sharp break; whereas curves D, E and F are broader and show ability to sustain a high force level longer.

V. TECHNICS AND DATA, TENSIOMETER WITH STABILIZATION, 1950

A. Method

The standard positioning and stabilization employed in measuring knee extension forces with the tensiometer are shown in figure 7. The same pelvic strap arrangement and the tensiometer are shown, the latter attached directly to a strap around the ankle cuff. The lead-off cable is at a right angle to the tibia. This cable is run through a system of pulleys, giving the physical therapist a 6:1 mechanical advantage in stretching muscles during contraction. Mechanical advantage is needed in order for the physical therapist to be entirely adequate for forces ranging up to 300 lb. or more. A mechanical stop is arranged in the pulley system so that the angle of knee flexion is exact. The equipment can be adjusted for legs of different length so that the angle of knee flexion is maintained constant for different subjects.

B. Comparison of isometric tension with myotatic impulse force

In one series of ATG method experiments, a systematic charting of the relationship between the level of isometric tension (IT) and the magnitude of the myotatic impulse force (MIF)—that is, the dynamic force developed when contracting muscles are stretched—was accomplished. Isometric tension (IT) was measured at six positions in the arc, namely, at 15°, 30°, 45°, 60°, 75° and 90° of knee flexion. The myotatic impulse force was measured for the corresponding five ranges of knee flexion, namely 15-30°, 30-45°, 45-60°, 60-75° and 75-90°. A random sample of 16 boys and girls at each age level from 6 to 12 years, or a total of 112 subjects, served in this experiment, which extended over a period of five months. At each test session, isometric tension was measured at four selected

TABLE VI

Analysis of Variance for Grouped Means from Table V

Source of Variance	Sums of Squares SS	Degrees of Freedom DF	Variance or Mean Square MS	Variance Ratio F	P%
Between therapists & samples (B_1, C_1, D_1,)	1,394	2	697	13	< 0.1
Within groups (subjects)	124,622	2,325	53.6		
Total	126,016	2,327			
Between therapists, rounds & samples (A_1, A_2, B_2, B_3)	14,337	3	4,779	108	≪ 0.1
Within groups (subjects)	200,428	4,508	44.5		
Total	214,765	4,511			

< means *less than*

≪ means *much less than*

positions, and myotatic impulse force was measured for three selected ranges. Two complete rounds of tests included all positions and ranges, and two positions were rechecked a third time.

The average trend curves for the total sample of subjects derived from the second round of tests are shown in figure 8. Note that the isometric tension (IT) level is minimum at 15°, rises smoothly to a maximum level through the range from 50° to about 80°, and drops slightly at 90°. At maximum the level is about twice that at 15°. This sample of subjects represents an average age level of 9.0 years. Similar curves for the 9-12 year group are at a higher level. The curve for the myotatic impulse force shows an increasing percentage rise above the isometric tension level with increasing angle of flexion. The percentage excess of myotatic impulse force relative to isometric tension increases with the degree of initial tension (or initial length) of the quadriceps muscles.

1. Myotatic impulse testing

The relationship between these two curves brings out an important observation relative to manual muscle testing. When the physical therapist is applying force and attempts to passively stretch the quadriceps causing flexion of the knee, the act of stretching is opposed by the myotatic impulse force. There is a dynamic increase in quadriceps contraction resulting from stimulation

TABLE VII

Significance (t-Tests) of Differences between Selected Pairs of Means (Table V) with Reference to Comparisons between Individual Therapists and Rounds

Identification of Means by therapists	Diff. (lb.)	t*	P%
$B_1 - C_1$	2.67	3.37	< 0.1
$B_1 - D_1$	3.45	4.90	< 0.1
$C_1 - D_1$	0.78	1.02	< 50.0 > 20.0
$A_2 - A_1$	6.15	11.20	≪ 0.1
$B_3 - B_2$	7.25	14.87	≪ 0.1
$A_1 - B_2$	2.41	3.48	< 0.1
$A_2 - B_3$	1.31	2.63	< 1.0 > 0.5

* Degrees of freedom are ∞ for each test.

P% (two-tail test) = 2Q x 100 (Pearson & Hartley).

(∞ infinity sign)

< means *less than*

> means *greater than*

≪ means *much less than*

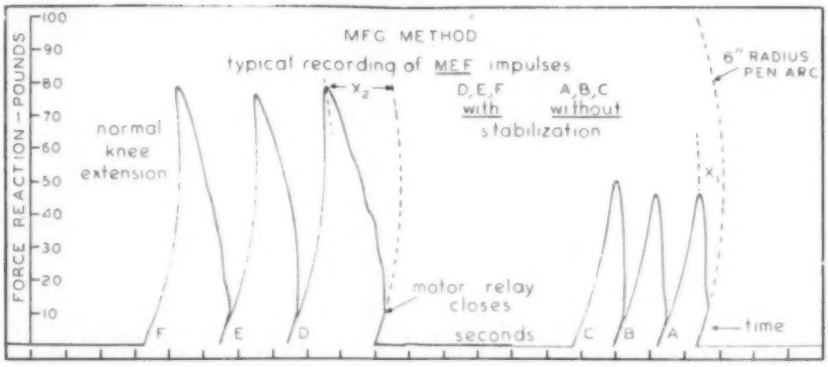

Figure 6. An example of EMD recording of knee extensor force by MFG method, with and without pelvic strap stabilization. These records were made in immediate succession on the same subject by the two methods. Additional explanation in text.

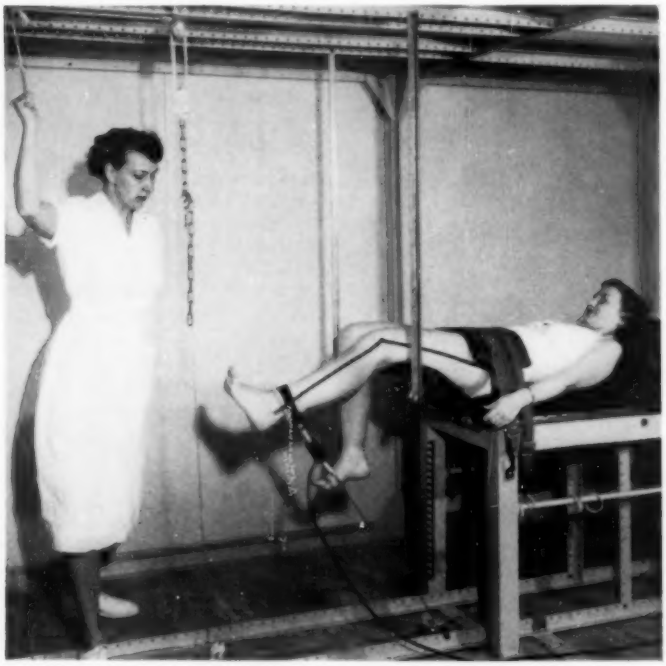

Figure 7. Standard arrangement of equipment and subject (ATG method) for measuring isometric tension and myotatic impulse force of knee extensor action on normal subjects and patients with a clinical manual grade of fair or better.

TABLE VIII

Comparative Results—Three Therapists
Knee Extension with Pelvic Strap Stabilization
Axial Tensiometer Gage Method, Supine

Therapist	Subjects	Tests		Mean $\bar{X}$	Std. Dev. s	Coeff. V%
		Type	N			
A	36	IT	216	80.23	16.86	21.01
E	36	IT	216	79.15	17.18	21.71
F	36	IT	216	78.85	15.79	20.03
A	36	MI	216	113.20	25.50	22.53
E	36	MI	216	112.62	20.40	18.11
F	36	MI	216	111.60	17.00	15.23
A	240	IT	1,440	79.27	18.96	23.92
A	240	MI	1,440	110.03	23.25	21.13

Isometric tension (IT) was measured at the 60° arc position. The myotatic impulse (MI) was measured at 60-75° stretch range, using a 4:1 pulley and cable. N for tests is three maximum effort trials each, right and left. The groups were approximately equally divided boys and girls.

of the stretch reflex system by the stretching act. For knee extension near zero this percentage increase is small, and the physical therapist is required essentially to match only the level of isometric tension of which the subject is capable. In the midrange of the arc and beyond, the physical therapist must not only match the isometric tension level, but also the self-generated myotatic impulse force which adds from 35 to 45 per cent more force to the quadriceps contraction. The myotatic force is the factor measured with the MFG method, since passive stretching is employed.

The myotatic impulse force is present regardless of whether the muscles are contracting at maximum level. Muscles can be stretched at any level of initial contraction, and when so stretched a myotatic impulse force is added. This has an important bearing upon interpretation of a manual muscle test criterion. Ordinarily, it is assumed that when the physical therapist causes motion of the extremity against presumably maximum effort by the subject, that the subject's maximum resistance has been overcome. This criterion implies that the physical therapist has applied adequate force for appraising maximum effort. The above principle is contradictory to this criterion, and the fact that stretching is accomplished is not evidence that maximum contraction has been either attained or overcome.

2. Comparative results of three physical therapists—ATG method

In another series of experiments during 1951,

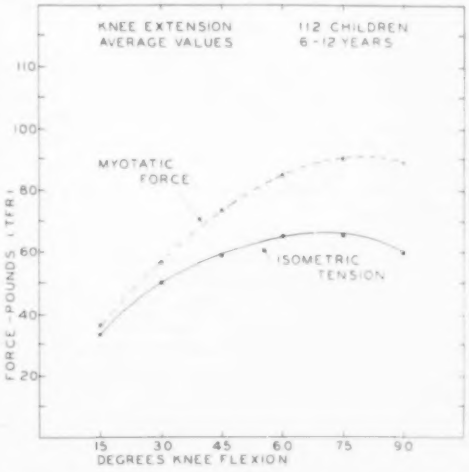

Figure 8. Fundamental relationships between angle of knee flexion (degrees departure from complete extension) and average force level of isometric tension and myotatic impulse forces among children. *Tangent force reaction* is the force measured at a right angle (tangent) to the central axis of the extremity at a specified position in the natural arc of motion.

TABLE IX

Analysis of Variance for Grouped Means in Table VIII

Source of Variance	Sums of Squares SS	Degrees of Freedom DF	Variance or Mean Square MS	Variance Ratio F	P%
Isometric tension (IT)					
Between therapists & samples	10	3	3.33	0.25	> 25.0
Within samples (subjects)	27,809	2,084	13.34		
Total	27,819	2,087			
Myotatic impulse (MI)					
Between therapists & samples	118	3	39.33	1.92	< 25.0 > 10.0
Within samples (subjects)	42,703	2,084	20.49		
Total	42,821	2,087			

> means *greater than*

< means *less than*

a comparison was made among three physical therapists using the tensiometer method. Three truly random samples of 36 children each were drawn from the 9 to 12 year age group. About half of these subjects had been used in the previous study of the arc relationships, and were 'experienced' for the task. Each subject was given two rounds of tests, in which isometric tension was measured at the 60° and 75° positions, and the myotatic impulse force was measured through the arc range 60-75°. Three measurements of the isometric tension (IT) and myotatic impulse force (MIF) were taken for each side, right and left in each round. Two of the physical therapists had no previous experience with this method, and the third was physical therapist A, mentioned previously. Following this experiment, physical therapist A carried out the same set of tests on 240 children in the school, who comprised the remainder available in this age range.

Statistical reductions of the data for this whole sequence of tests with the ATG method are given in table VIII, and evaluation of variance is given in table IX. One is impressed immediately with the obvious fact that physical therapists A, E and F obtained quite similar results for both IT and MIF data on relatively small samples of children. As a group, these results do not appear to differ from those obtained by physical therapist A on a much larger sample of 'inexperienced' children. Analysis of variance given in table IX confirms this impression, and the conclusion is reached that the results obtained by different physical therapists with this method did not attain statistically significant differentiation. The F test shows that differences as great or greater than those shown between physical therapists could be expected 25 per cent or more times in continuous random sampling for the IT tests, and between 10 and 25 per cent for the MIF tests.

The MIF test in ATG method is most comparable to the MFG method, since passive stretching is employed. The grand mean of the MI tests in table VII for all samples is 110.79 lb. This may be regarded as the best estimate of normal knee extensor force among children 9-12 years obtained in the series of studies on influence of method. The MIF test results compared with the whole sequence of values obtained with the MFG method throughout the investigation, indicate that limitations of physical therapists in applying force impose bias on the estimates of normal force. The best results obtained with the MFG method in 1950 still grossly underestimated the results obtained finally with the tensiometer (ATG) method. Secondly, even inexperienced therapists can be trained quickly to obtain comparable results in a first round of tests on small random samples of children with the ATG tech-

TABLE X

Influence of Method on
Correlation between Knee Extension Force & Body Weight
Normal children, 9–12 years

Year	Body & Arc Position	Therapist	Method	Tests (pairs)	Coefficient (r)
1946	Supine 75-90°	A	MFG-A	820	0.246
	Sitting "	A	"	"	0.240
	Sitting 15-30°	A	"	"	0.180
1947	Supine 75-90°	A	MFG-B	798	0.521
	Sitting "	A	"	"	0.432
	Prone "	A	"	"	0.400
	Sitting 15-30°	A	"	"	0.495
1948	Supine 75-90°	A	MFG-C	600	0.559
	Sitting "	A	"	"	0.510
	Supine 15-30°	A	"	"	0.544
	Sitting "	A	"	"	0.530
1949	Supine 60-75°	A-1	MFG-C	936	0.784
	" "	B-1	"	1,044	0.716
	" "	C-1	"	648	0.705
	" "	D-1	"	636	0.619
	" "	B-2	"	984	0.794
1950	Supine 60-75°	A-2	MFG-C	1,776	0.845
	" "	B-3	"	816	0.815
1951	Supine 60-75°	A	ATG-IT	1,440	0.941
	" "	A	ATG-MT	"	0.937

No artificial stabilization was used during 1946, 1947 & 1948. The same type of pelvic strap stabilization was used in all subsequent tests. N for subjects, divide 'TESTS' by 4 for 1946; by 6 all other years.

nic. This does not mean, of course, that with the tensiometer method no training is necessary. Both physical therapists E and F received over a month of daily practice in using the tensiometer (ATG) technic before conducting the experiment as described above. This training, however, covered precautions to be observed in aligning the subject, setting the proper angles for the knee joint, arrangements of the physical equipment, and operating the electronic equipment. On the other hand, with the MFG method, factors relating to the physical therapist's active participation in applying force assume predominant importance. In the final testing of knee extensor action these factors prove to be the ones that impose distortion on the results obtained, even when adequate artificial stabilization is used. But when artificial stabilization is not used, the inability of the subject to stabilize the body mass and countertensions of the subject impose a still larger error in the estimate of normal knee extensor forces.

VI. Correlation Between Knee Extensor Force and Body Weight

The data obtained from the tensiometer (ATG) series on normal subjects from 6 to 12 years of age was tabulated in relation to body weight and product-moment coefficients of correlation were calculated. A fundamental law was immediately apparent. Isometric tension at 60° correlates 0.941 with body weight of the subjects; the myotatic impulse force for the arc range 60-75° correlates 0.937 with body weight. Considering that there is always experimental error between measurements, and that body weight fluctuates independently of muscular develop-

ment, this high correlation between these two variates reveals a highly predictive factor for knee extensor force in normal children. Examination of the data in relation to age shows linear regression. At any age between 6 and 12 years, the same predictive factors are applicable. The ratio of isometric tension to body weight is 0.91, and the ratio of myotatic impulse force to body weight is 1.23. Rounding off, the ratios 0.9 and 1.2 times body weight gives the average (expected) value of knee extensor force at the portions of the arc specified. This is an exceedingly important index, since it provides the basis for estimating deviation from normal in individual cases, without reference to statistical tables. The index also provides a valid basis for estimating the adequacy of a testing technic by an independent criterion.

After this fundamental relationship between knee extensor force and body weight of the subjects was revealed by the ATG tests, correlation coefficients between these two variates were calculated for all sets of tests which had been carried out by MFG methods. The results from these calculations are given in table X.

The discussion is limited to a comparison of correlations for the supine position with the arc ranges 75-90° and 60-75°, which are the most comparable positions for studies during different years. The coefficients r shown in the last column of the table reveal a continuous progression from low to high throughout the whole sequence. For the 1946 tests, r was only 0.246; in 1947, r increased to 0.521. This is of particular interest because the mean force levels did not change significantly for these two years (Table I), yet the r values more than doubled. This fact is interpreted as meaning that the 1947 tests were more valid measures for individual subjects, even though the corresponding group means for the force values were not significantly different (Table IV). This observation is construed as confirming the physical therapist's opinion mentioned earlier that she was convinced the MFG type B permitted her to apply force more accurately and effectively than type A, which had been used during 1946. The apparent explanation is that the type B gage supplied an arrangement whereby the physical therapist could control the application of force more effectively at a right angle to the arc of motion of the extremity, whereas the plastic model (type A) permitted her unknowingly to vary this angle of approach and hence obtain erroneously higher or lower readings randomly. In the 1948 tests, when the type C gage with pressure cuffs was first used, the coefficient r was still higher at 0.559, indicating additional gain in the validity of the testing method in relation to individual subjects.

In the 1949 tests, which included use of pelvic strap stabilization, the correlation r obtained by different physical therapists in various rounds ranged from 0.619 to 0.794, indicating further increase in validity of the force measurements but also differences between therapists in this respect. Therapists B_1 and C_1 in their first rounds of tests obtained r values of 0.716 and 0.705, whereas for therapist D_1 the r was only 0.619, indicating that D_1 was not conducting tests as validly by the adopted criterion even though each of the three physical therapists had the same training, equipment, and methods. The results obtained by physical therapists B_1 and C_1 in 1949 were considerably more valid measures of individual children than those obtained by physical therapist A in 1948, even though the mean force levels for groups were nearly equal (Table V). Such a result must be due to a variety of factors, but undoubtedly use of the pelvic stabilization strap is the most important. Finally, in the 1950 rounds of tests by therapists A_2 and B_2, the r value increased to 0.815 and 0.845, which is still closer to the criterion result of 0.937 obtained with the tensiometer method.

The result is also of interest from the kinesiological point of view. Since the knee extensor group is among the more important antigravity muscles, and they are used continuously, especially by children, in managing the body weight (as in jumping, running, climbing, ascending and descending stairs) the functional use of these muscles could be expected logically to bear some direct relationship to body weight. The fact that the relationship is so marked, of course, could not be anticipated; consequently, the experimental demonstration of this factor appears to be of outstanding importance for estimating normality both kinesiologically and clinically.

VII. KNEE EXTENSOR FORCE AND MANUAL MUSCLE TESTING GRADES IN POLIOMYELITIS PATIENTS

A. *Method and analysis of data*

Concurrently with the studies on normal children in the elementary schools, studies were conducted in hospitals and clinics on poliomyelitis patients at the postconvalescent stage. Relationships obtained between force measurements of knee extensor action and the manual muscle testing grades of normal, good, fair-plus and fair are considered. The customary letters N, G, F+ and F are used to designate these clinical grading

TABLE XI

Knee Extension Force and Manual Test Grade
Post-convalescent Poliomyelitis Cases, 9–12 Years
MFG Method, 60–75° Arc, Supine

Manual Grade		Subjects	Tests Each Side N	Mean $\bar{X}$		V%	
one side	other side			S	W	S	W
N	N	152	456	48.10	40.88	26.94	27.10
N	G	53	159	49.00	31.62	30.02	37.19
N	F+, F	30	90	48.64	9.49	32.44	78.08
G	G	68	204	42.47	34.77	33.20	38.48

S = stronger side, W = weaker side, as measured.
N for tests is 3 maximum effort trials, each side.

categories, and a pair such as NG will mean 'N' for left and 'G' for right.

Groups of data that are comparable with the 1949 and 1950 technics on normal children have been selected for analysis. While earlier data had been obtained clinically by less adequate methods, there is striking agreement between the earlier and later methods from the clinical studies. This is interpreted as meaning that, in general, there is less need for the artificial stabilization methods on weakened actions as compared with requirements for normal subjects.

Some interesting facts on the status of the knee extensor force in relation to manual muscle testing grades assigned by clinical therapists are shown in table XI. The first column shows the manual grades as assigned for both sides of the patient. The force measurements were classified according to stronger or weaker side, when the manual grade was the same for both sides. The columns of mean values are of interest.

Note that when both sides are graded normal (NN), the stronger side average is 48 lb. and the weaker 41 lb. in round figures. This is a greater difference than is evident in normal subjects. The group averages for knee extensor force of normal children tested by the improved MFG or ATG methods, show differences between stronger and weaker sides to be slight, ranging from 1 per cent to 5 per cent maximum. In the comparison for poliomyelitis patients, the stronger side exceeds the weaker by 20 per cent, which is a highly significant difference. This is evidence of differential weakness on the two sides. Secondly, the level of the stronger side at 48 lb. should be compared with the level of the ATG estimates for normality at this age level, since the therapist was not handicapped in applying force at the average level of 50 lb. by the improved MFG technics. Samples of these poliomyelitis patients were checked by the tensiometer method, and precisely the same values were obtained as with the MFG method used for the majority of patients.

The manual muscle test grading segregated classes of patients as "normal" for whom the force measurements revealed a condition that was approximately 50 per cent normal. When the clinical physical therapists assigned a different grade for the two sides, one being normal and the other good, the normal side averaged 49 lb. and the good side only 32 lb. This is a difference of 17 lb., which indicates the average amount of variation when the physical therapist distinguished between the two sides by simultaneous comparison or comparison in immediate succession. In this instance, the N side was *53 per cent* higher than the G side, or to put the percentage in reverse the G side averaged *65 per cent* of the N side. When the physical therapist assigned the same grade G to both sides, as shown on the fourth line, the stronger side averaged 43 lb. and the weaker 35 lb. In this instance, the stronger side which was not distinguished was 23 per cent higher than the weaker side. The stronger side of the GG pair is higher than the weaker side of

the NN pair, but the weaker side of the GG pair is markedly lower. It is obvious that the weaker side of the GG pair served as the therapist's criterion to assign the grade good, and both sides were given the same grade since the average difference was not sufficiently great for her to make a distinction. Thus, in the instances of NN grades and GG grades, differences of the order of 20 to 25 per cent are not distinguished in the range of forces from about 30 to 50 lb.

On the average, 50 per cent differences exist when a distinction is made between N and G for the cases shown on line 3. When one side is graded N, and the other side is either F+ or F, the N side again averages about 49 lb. and the weaker side average is 9.5 lb. In this case the stronger side produces knee extensor force 516 per cent higher than the weaker side, or in reverse the weaker side is only 19 per cent of the stronger. The F+, F combination averages about 9 per cent of normal force as judged by tensiometer criterion.

It is of considerable interest to note that the stronger sides for which the manual grade N was assigned all average 49 lb. If these children had been truly normal, comparable with non-polio children, the averages should have been at least 75 to 80 lb. by the method used. It is necessary to conclude, therefore, that the great majority of polio patients in this sample who were assigned the manual grade N in reality had approximately 50 per cent loss in knee extensor force. Estimation of normality by the manual muscle testing method, therefore, failed to reveal marked degrees of weakness in knee extensors. This muscle group is capable normally of producing forces well in excess of physical therapists' habits or capacities for applying force as a criterion for making a judgment. In addition, we may conclude that since differences of 20 to 25 per cent were not distinguished between the two sides, percentage rating scales that require much finer distinctions are not likely to be achieved in practice.

CONCLUSIONS

The manual approach even with the improved MFG method and adequate stabilization, is inadequate for estimating the knee extensor forces among normal children 9-12 years of age as revealed by the tensiometer method. When no stabilization is used, potential muscular forces can not be expressed fully, because the body mass is unable to counterpoise the knee extensor forces. Manual muscle test grading of normality for knee extension in this age range of children fails to screen out weakness that is approximately 50 per cent below normal. This result indicates that the majority of these postconvalescent poliomyelitis patients had knee extensor force which averaged less than half that for the nonpoliomyelitic normals, and that clinical manual muscle testing fails to identify weakness when this action is only 50 per cent of normal and in some instances less than 50 per cent of normal.

A rather startling but reasonable conclusion relating the general epidemiological implications on the effects of poliomyelitis to the present data is that a major portion of children who are discharged with the clinical rating of 'normal' for the knee extensor muscles *on the average* have suffered a 50 per cent loss. Since our general statistics on paralytic poliomyelitis are based upon clinical, not quantitative, muscle testing, views as to the incidence of muscular weakness resulting from poliomyelitis probably involve gross error deriving from inadequate means employed in identifying degrees of paresis.

The effects from poliomyelitis as seen throughout the quantitative data obtained in this investigation reveals a continuum in degrees of muscular weakness quite similar in general characteristics to the distribution of hearing losses, which the author discovered in large population groups. This raises a question regarding validity of the two-fold classification of 'paralytic' and 'nonparalytic' forms of the disease, quite similar in roots to the outmoded view that people either have approximately normal hearing or they are deaf. Whether one elects to call a 50 per cent loss paralytic or not is largely arbitrary, since there is no discrete point in a continuous scale of deviation from normal where one can formally demarcate 'paralytic' and 'nonparalytic'.

From the standpoint of functional usefulness, a 50 per cent loss in knee extensor force as determined quantitatively has been observed repeatedly in this investigation to constitute a severe handicap in the usual activities of children. Such observations were most convincing in many instances of children observed and measured before and after an attack, showing severe losses by quantitative norms, and yet were classified clinically as complete recovery with normal muscle tests or as 'abortive' cases.

Aside from paired comparisons, which throw light on the degrees of distinctions made by physical therapists in manual muscle test grading of knee extension, it is of interest to note a comparison of these force levels with the nonclinical norms obtained with the ATG tests.

Taking the grand mean of the ATG tests on 9-12 year children at 110 lb., the percentage level of the manual muscle tested groups are normal, 45 per cent; good, 33 per cent; and the fair-plus-fair combination, 8.6 per cent. It is concluded, therefore, that manual muscle test ratings for knee extension depart grossly from the theoretical percentages assumed at normal, 100 per cent; good, 75 per cent; and fair, 50 per cent.

This report has been confined to analysis of one action, knee extension. It was mentioned earlier that concurrently 38 joint motions of the trunk and extremities have been studied in similar manner. The conclusions, which are developing from additional analysis, are not the same for all actions as those outlined here for knee extension. For some muscular actions the error of manual muscle test grading is appreciably greater than it is for knee extension, and the MFG method is also more inadequate as a means for estimating normal force levels. On many actions the MFG method is entirely adequate, since the force ranges are easily manageable by most physical therapists; but corresponding manual muscle test grading shows marked discrepancy because of human error in estimating small percentage differences in forces at low levels. This is an inherent limitation of human judgment, not a question of particular lack of skill peculiar to individual therapists. There are only two alternatives to follow in attaining accuracy in clinical evaluation of muscular forces: (1) the best procedure is to measure the forces, along the lines the author has developed; (2) a less desireable method is to devise practical tests by which approximations to quantitative estimates can be made. The second procedure is obviously better than customary manual muscle test grading.

Too much disregard exists for accuracy of estimates in the range of normality. Since nonclinical normality is the most appropriate objective and physiologically meaningful reference for estimating deviation from normality in all phases of clinical medicine, there appears to be no good reason why the same principle should not apply to evaluation of muscular functions. It is now apparent that in manual muscle test grading any response may be graded normal if the patient resists whatever level of force the therapist applies as a criterion for judgment. Just what this level of force is for various actions by different therapists is not known. In the present work, however, the forces physical therapists can and do apply have been sampled, and even when extreme effort is made far beyond that used clinically in assigning grades, the result oftentimes is that the applied force is well below the capacity of the patient. The examiner can not make a judgment of force that is far beyond the particular individual's capacity to apply a matching force. Therefore, all estimates of normality are marked off by the dividing line determined by the examiner's own ability to apply force. For those actions where the examiner is adequate, then the limitation of skill in distinguishing differences between forces either simultaneously or from memory introduces large error. It becomes clear after considering all aspects of these problems that quantitative testing is the only means for achieving a reasonably accurate knowledge of muscular function. But even when quantitative testing is employed, the method of employing it is equally important, as these studies have clearly revealed.

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The Physiologic Basis of Electrodiagnosis

Morris Vogel, B.S., Lawrence Weinstein, B.S., Edward Delagi, M.D., and Arthur S. Abramson, M.D.

Physical Medicine attempts to evalute residual functional capacity and to improve it by training when such residual capacity falls below that needed to perform daily activity. Thus, Physical Medicine has a role in diagnosis and treatment. This paper will be concerned with the role in diagnosis and the physiological phenomena which make electrodiagnostic technics possible and understandable.

Most diagnostic technics are employed to determine the integrity, or lack of it, of the lower motor neuron. The lower motor neuron has been called the final common pathway of the nervous system, since each cell acts as a funnel collecting impulses from an enormous number of other nerve cells. A single lower motor neuron, whose cell body lies in the anterior horn, through its dendrites may be in contact with fibers from as many as a thousand axon terminations of other cells in the nervous system. These axon terminations may be those of the upper motor neuron, of the internuncial cells, or those of the afferent or sensory cell. The lower motor neuron is always in contact with striate muscle as the effector organ. Thus, the overt manifestation of the great bulk of the nervous activity of the central nervous system is the physical act produced by muscle contraction resulting from stimuli received along the final common pathway. Disturbances of function vary, depending on whether the lesion is of the upper motor neuron, the internuncial cell or the sensory cell. Involvement of the final common pathway, however, gives a uniform picture of disturbance in function.

The anterior horn cell, its axon and the muscle fibers innervated by it, are a functional unit and are referred to as the motor unit. The axon may branch many times and each axon branch innervates a single muscle fiber. In the smaller muscles, dealing with finer movement such as the intrinsic muscles of the eye, the ratio of axons to muscle fibers is approximately 1:3, whereas, in the larger muscles of the lower extremities, dealing with coarser movements, the ratio may go up to as high as 1:300.

The cell body fires off as a result of the stimuli reaching it. Stimuli reach it at all times and at all hours of the day and night. Despite this constant stimulation, it is not continuously firing off. The innumerable axon termination reaching the cell from different sources within the central nervous system makes it imperative that the cell does not respond to stimuli reaching it from one axon termination alone, otherwise it would be in constant activity. The adequate stimulus for firing off the anterior horn cell, therefore, must be a temporal summation of many impulses reaching it. When the body fires off, an impulse is set up which travels down the axon and the axon branches to the myoneural junctions where the impulse is transmitted to the muscle fiber, which then contracts in response to it. All muscle fibers of the motor unit will contract simultaneously in response to the firing of the single cell.

All of these phenomena depend upon the membrane potential. This is not an anatomical concept since such a membrane has not been established on a morphological basis, but it can be demonstrated that the inside of the nerve cell with its axon and even the muscle fiber is negative in relationship to the outside. This potential difference is of the order of magnitude of just a few microvolts (50 or more). It is also known that the impulse travels along the surface of the fiber. Stated in its simplest terms, the impulse is set up by a local depolarization and is conducted by a traveling wave of depolarization, commonly called the wave of negativity.

This sounds like an electrical phenomenon but unlike conduction of electric current along a wire, the nerve follows the principle of the core conductor in which the impulse travels along the surface in a circular wave form, thus increasing tremendously the distance which the current has to travel. This explains the relatively slow conduction time.

There is an associated chemical phenomenon since the inside of the cell is richer in potassium ion than is the outside; whereas the outside is richer in sodium ion than is the inside. With

From the Physical Medicine and Rehabilitation Service, Veterans Administration Hospital, Bronx 68, New York.

the discharge of the membrane potential, the potassium ion has a tendency to flow outward and the sodium inward, but when the membrane potential is reestablished, the relative concentrations of potassium and sodium are reestablished within and without the cell. This is due to a phenomenon called the "sodium pump."

The exact chemical and electrical nature of conduction has not yet been definitely established.

It has been shown that the impulse can be transmitted along an axon in a saltatory fashion, jumping from node of Ranvier to node of Ranvier, the nodes themselves acting like temporary capacitances. The impulse follows the all-or-none law. Single impulses pass down a nerve only when the stimulus is produced by experimental means. Under purely biological conditions, impulses pass down in trains with frequencies as high as 150 per second, or even greater. Muscle tension produced depends largely upon this phenomenon, as well as the phenomenon of recruitment.

The transmission of the impulse across the myoneural junction is probably electrochemical. An action potential has been demonstrated at the junction. The acetylcholine-cholinesterase system has also been implicated in the process. Again, the exact nature of this electrochemical transmission has not been definitely established.

The muscle fiber follows the same conduction principle as that of the axon, the impulse passing along its surface. The contraction within the muscle fiber occurs in a wave-like form but follows the all-or-none principle.

The speed of conduction of an impulse along a nerve fiber is directly proportional to the diameter of the fiber. In other words, the larger the fiber, the more rapid the transmission of the impulse. A whole mixed nerve consisting of fibers of many sizes, will therefore demonstrate impulses traveling along it at different rates of speed. The action potential of the whole nerve indicates that fibers of mixed nerves can be divided into three large groups—A, B, and C fibers; the A fibers are the largest and the fastest and are mainly motor nerve fibers.

Both the nerve and the muscle can be stimulated directly, the latter only in the presence of denervation. The muscle response to a single stimulus of the nerve is a twitch. The muscle response to a direct stimulation of the muscle is more sluggish because of the nature of contraction of the muscle itself. This principle is used in the diagnosis of denervation. The basic tool in the diagnosis of neuromuscular integrity is the externally applied stimulus. The stimulus may be electrical, mechanical, chemical or thermal, but the one most frequently used is the electrical stimulus.

Stimulus

The stimulus possesses two characteristics—intensity and duration. A stimulus of high intensity and short duration will produce the same effect as a stimulus of low intensity and long duration. By varying time and intensity, a curve can be plotted which is characteristic for the nerve. This is called the strength-duration curve. This curve is exponential in configuration. With a gradual occurrence of denervation, this curve rises, so that greater time and greater intensity is needed for any single stimulus. Complete denervation shows its characteristic curve, characteristic of muscle rather than nerve. Gradual reinnervation produces a gradual dropping of the time and intensity of the stimuli needed and a dropping of the curve back to its former position. In other words, the lower curve is that of the completely innervated muscle and the upper curve is that of completely denervated muscle; all the curves in between indicate varying degrees of denervation and innervation. A series of curve determinations from time to time is, therefore, diagnostic and prognostic. The curve of a partially denervated muscle is often a double one, carrying with it both the denervation and the innervation curves.

Chronaxie

The strength-duration curve requires determinations of the time and intensity of many stimuli. A short cut method is the use of the chronaxie determination. The minimal current intensity necessary to produce a contraction is usually one of long duration. This is called the rheobase. When this current intensity is arbitrarily doubled, the time it must flow to produce minimal contraction is much shorter. This shorter time is called the chronaxie. With gradual denervation, the chronaxie will obviously rise and with reinnervation it will fall again. Thus frequent chronaxie determinations, being indices of strength-duration curves, are also diagnostic and prognostic.

Galvanic and Faradic Testing

Faradic current is synonymous with alternating current and provides a continuous train of stimuli. The time of the single stimulus depends

upon frequency and the intensity is modifiable at will. The single half cycle, being a single stimulus, will stimulate innervated muscle if the current is intense enough. Innervated muscle responds to faradic current in the form of a twitch. The single stimulus is too short to stimulate completely denervated muscle.

Galvanic current is direct, straight flowing current. The intensity and duration of this current can be modified at will, dependent upon the making and breaking of the current. Denervated muscle will respond to the proper galvanic current with a sluggish, worm-like response.

An alternating current of low enough frequency will produce a half cycle of sufficiently long duration to stimulate even denervated muscle. This is true of such a current when it reaches about 25 cycles per second.

Here again the time and intensity of currents are used to make a differential diagnosis between innervation and denervation. Obviously, a partially denervated muscle will also respond with a twitch but in a much weaker fashion. Thus, besides the intensity and duration of the stimulus, the nature of the contraction is also of great importance in the interpretation of this test.

Electromyography

The passage of a stimulus down an axon is accompanied by an action potential. The contraction of muscle in response to the passage of a stimulus along its surface is also accompanied by an action potential. The individual muscle fiber action potential can be detected only if it is denervated as it spontaneously contracts in response to the presence of small quantities of acetylcholine in its environment. This potential is tiny, being of 2 millisecond duration and of 50 microvolts amplitude. The presence of such an action potential is pathognomonic of denervation. In the presence of complete innervation, the muscle fibers in the motor unit contract together and so all their action potentials fuse to form a large one of a duration of 10 milliseconds and perhaps 1,000 microvolts in intensity. This is indicative of innervation. In the presence of gradual denervation or gradual innervation a complex potential is present. These findings give an excellent idea of the status of neuromuscular integrity. Thus, a normally innervated muscle will produce only motor unit potentials. A completely denervated muscle will produce only muscle fiber potentials or fibrillations; where as, a partially denervated muscle will produce both motor unit and muscle fiber potentials. Finally, a muscle which is gradually innervating or gradually denervating will produce motor unit, muscle fiber and complex potentials. The determination of whether the process is one of gradual denervation or gradual innervation will depend largely upon the history and diagnosis.

All of these tests are contingent upon the state of wallerian degeneration. When an axon is cut, its peripheral portion remains capable of conducting an impulse for several days, or until wallerian degeneration renders it incapable of doing so. Thus, strength-duration curves and chronaxies do not rise appreciably for the first week or ten days after nerve section. Faradic current will produce twitch contraction even in the presence of paralysis for the same period of time. Muscle fiber potentials or fibrillations will not appear until wallerian degeneration is complete.

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Graded Functional Exercises: For Leg Muscles

Jessica A. Hopkins, B.A.

Numerous mechanical devices have been contrived to provide graded exercise for the activators of the foot and ankle. Most of these devices prove unsatisfactory because of the ease with which knee motion can be substituted for dorsiflexion and plantar flexion of the ankle and hip motion substituted for inversion and eversion of the foot. As soon as weight-bearing is permissable the activators of the foot and ankle can be exercised most effectively by isolating normal weight-bearing functions of these muscles. Weight-bearing exercises provide proprioceptive stimulation of functional performance. The energy expended in nonweight-bearing motions of inversion, eversion, dorsiflexion and plantar flexion is insignificant in comparison with the work which is normally performed by the muscles of the leg in the stance phase of walking. When the foot is in contact with the floor and fixed by the superimposed body weight the muscles act to produce motion at the point of origin, the so-called *reverse action*. The dorsiflexors then rotate the tibia anteriorly (A); the plantar flexors rotate the tibia posteriorly (B); the evertors rotate the tibia laterally (C); and the invertors rotate the tibia medially (D).

Dorsiflexors

The dorsiflexors perform their heaviest work at the beginning of the stance phase. At heel strike there is a strong shock-absorbing eccentric contraction of the dorsiflexors as the foot is allowed to plantar flex into full contact with the floor. Immediately following this there is a strong concentric contraction which rotates the tibia forward over the leading foot. In performing this shift of the center of gravity over the leading foot the dorsiflexors are aided by the forward momentum of the hind foot push-off but still must act on the entire body mass. This forward shift of the center of gravity can readily be isolated as an exercise and closely graded as to difficulty.

Supervisor of Physical Therapy, Cleveland Rehabilitation Center, Cleveland, Ohio.

Recovery of Balance with Center of Gravity Displaced Posteriorly

Standing with the back to wall, the heels a few inches from the wall, and the body held rigidly erect, the patient slowly leans backward until the upper back rests against the wall. He then returns to a standing position. The exercise is graded by increasing the distance between the wall and the heels. Even though the dorsiflexors on one side are normal it has been found that the dorsiflexors on the weakened side will act to capacity if the exercise is graded to maximum performance.

Variations

1. If the patient cannot easily be taught to maintain straight body alignment, he may place his feet far enough away from the wall so that maximal contraction of the dorsiflexors is required with a push-off from head, shoulders, or buttocks.
2. If exercise to completion of the range of motion is desired, the feet may be held in dorsiflexion by having the patient stand on a wedge board. This greatly increases the difficulty of the exercise.
3. The dorsiflexors perform the same function of anterior rotation of the tibia on rising from a seated position. The demands on the dorsiflexors can be increased by advancing the feet to a position directly below or even in front of the knees.

Note: The foregoing exercises require some power in plantar flexion. Without this, the feet are pulled into dorsiflexion and anterior rotation of the tibia cannot be performed.

Plantar Flexors

In the normal walking pattern the plantar flexors act most strongly at the completion of the stance phase to elevate the heel in the final push-off. In order to perform this motion the plantar flexors must have sufficient strength to act against

the entire weight of the body. Rising on the toes is commonly used as an exercise when plantar flexors grade "fair" or better but it is difficult to give adequate exercise to plantar flexors that grade from "poor" to "fair."

Recovery of Balance with Center of Gravity Displaced Anteriorly

This exercise is the same as that previously described except that the patient now faces the wall. The elbows are held at the sides and the finger tips are used to break the forward fall as the patient slowly leans forward to place the forehead against the wall. The plantar flexors perform a strong eccentric contraction to control the anterior rotation of the tibia as the center of gravity moves forward. A strong concentric contraction is needed to effect a return to the vertical. This exercise can be performed bilaterally even when the paresis is unilateral. If graded to maximum difficulty the paretic side will participate as fully as possible. However, if in some instances unilateral exercise seems preferable, the contralateral foot must be held in front of the weight-bearing leg to eliminate its use as a counterbalance. The use of a wedge board to maintain the feet in plantar flexion will increase the difficulty of the exercise.

Return from Forward Stride Position

The plantar flexors of the hind foot will be found to act strongly during the return from a long forward stride. It is best to have the patient maintain both knees in extension during this exercise to minimize the push-off from the leading foot. Even with a straight leg the forward foot can be sharply dorsiflexed to provide a push-off from the heel but this is not of sufficient strength to effect the return from a long forward stride without assistance from the plantar flexors of the hind foot, acting to rotate the tibia posteriorly.

Rising on Toes

Rising on the toes of both feet is useless as an exercise for unilateral plantar flexor weakness since the normal leg requires no assistance from the paretic side. When hand support is used to assist in weight-bearing plantar flexion, it is impossible to tell how much weight is being borne on the foot. A head traction bar may be used for assistive hand support since the spring scale set into the traction gear can be read to ascertain how much of the body weight is being borne on the hands. At home the patient can stand tip-toe on an ordinary bathroom scale using the least possible hand support to find out how many pounds the plantar flexors can support. Use of a scale provides rough objective measurement of increased power between grades of "poor" to "fair," a range within which no gradation can be seen in performance of the usual test procedures. A floor scale may even be used to show progress beyond a grade of "good," if resistance is increased beyond the body weight by using the arms to pull or push downward against some fixed object.

EVERTORS

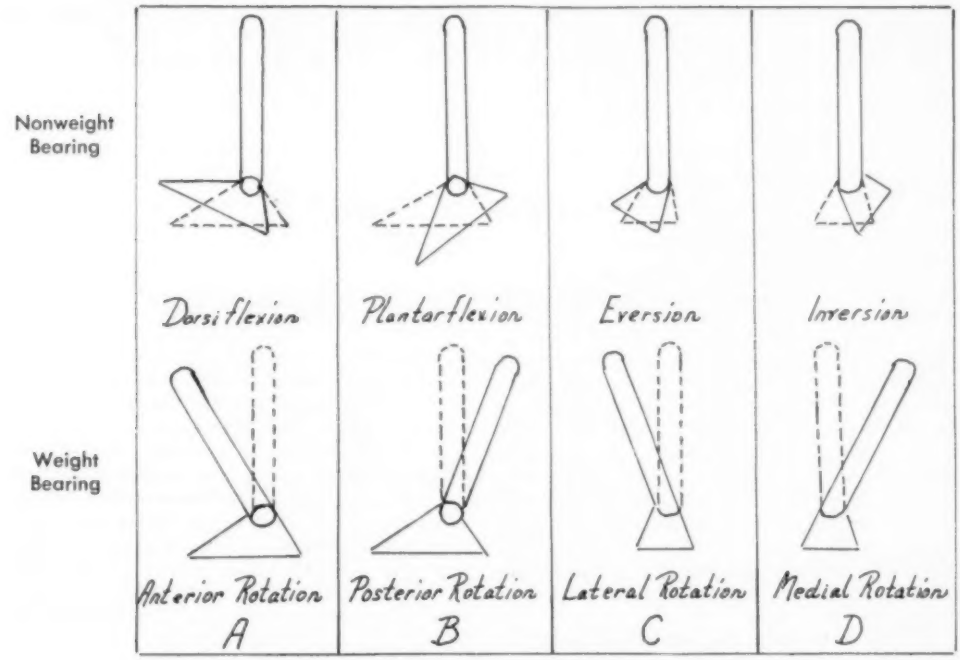
The evertors must maintain a state of strong contraction throughout the stance phase since in a normal gait the center of gravity is shifted only one inch lateral of the midline toward the weight-bearing side. The center of gravity therefore remains medial to the center of the foot, and the weight of the body would cause the tibia to rotate medially above the foot except as the tibia is held in proper vertical alignment by the pull of the peroneals. Weakness of the peroneals necessitates lateral flexion of the upper trunk toward the affected side in order to shift the center of gravity over the outer border of the foot. Therefore, the limp of peroneal weakness is identical to the limp of severe hip abductor weakness except that the shift of body weight toward the affected side need not be quite so extreme since the ankle joint is nearer the midline of the body.

One-legged Standing Balance

Balancing on one foot is a heavy exercise for peroneals as long as good standing alignment is maintained to avoid a shift of body weight to the outside of the foot. The work of the evertors can be lightened by holding a weight in the ipsilateral hand, increased by holding a weight in the contralateral hand.

Return from Side Stride Position

The evertors of the weight-bearing foot will be found to act strongly on the return from a side stride position, performing their proper weight-bearing function of lateral rotation of the tibia. Here again the knees should be maintained in extension to minimize the push-off from the returning foot. A stride of moderate width provides the most effective exercise for the peroneals



Translation of Nonweight Bearing into Weight Bearing

since they can rotate the tibia only when the foot is firmly fixed to the floor by the superimposed body weight.

INVERTORS

In ordinary standing and walking inversion strength *per se* is not needed except to correct possible overpull on the part of the evertors. In the stance phase of walking the body weight itself will effect medial rotation of the tibia without any active muscle pull. Obviously, however, the tibial muscles do maintain a state of contraction during weight-bearing. This is primarily in their capacity of structural support with the tibialis anticus acting as a dorsiflexor as well.

One-legged Standing

Although theoretically in one-legged standing no active invertor force should be required to maintain the proper alignment of the tibia in the sagittal plane, in actual practice the tibials are constantly being called into play to correct the overpull of evertors and plantar flexors. Invertor action can be markedly intensified by holding a heavy object in the ipsilateral hand.

Sideward Displacement of Center of Gravity

The patient stands with feet parallel to the wall and far enough away from the wall so that the balance is lost as the shoulder touches the wall. In returning to the erect position without using the arm to push off, the invertors of the inside foot are called upon to perform medial rotation of the tibia. One might anticipate strong contraction of the evertors of the outside foot as well, but this foot is too lightly weighted to provide fixation for strong evertor participation.

CONCLUSION

The foregoing exercises will serve as a basis for adaptation to the special requirements of a given patient. Each physical therapist will evolve

his own variations and modifications. Extensive use of this type of exercise has been made in cases of convalescent poliomyelitis and of healed fractures of the leg or foot. They are easily graded as to difficulty and, since no special equipment is needed, are readily available for home exercise programs, even where maximum resistance is indicated. Exercises of this type also provide the normal proprioceptive stimulation of actual functional performance.

Physical Therapy in Community Agencies

The 1955 APTA Conference workshop group on "Physical Therapy Within the Framework of Community Agencies" agreed upon four topics for discussion. They were: 1) what is a community agency; 2) what is expected of the physical therapist in a community agency; 3) how does the physical therapy program in a community agency differ from that in a hospital; and 4) does working in a community agency require of the physical therapist any special knowledge, skills, or abilities and, if so, how and where are these acquired.

For the purposes of this discussion, the group defined a community health agency as any organized program for public health that brings to all the people the benefits of modern medical and related sciences, including prevention and control of disease, promotion of healthful living, and the care and rehabilitation of the sick and handicapped. A partial listing of some of the community health agencies was made, and those agencies having representation in the group explained the services they offered. There seemed no doubt in anyone's mind that community health agencies were playing a vital role in the rehabilitation of patients. The role that each agency assumed in the total rehabilitation of a patient varied according to the policies of each agency and the needs of the patient.

In order to determine the answer to the question of what is expected of a physical therapist in a community agency, the group was divided into four informal subgroups, according to similarity of interests and types of agencies represented. It is significant that out of these independent buzz sessions there was developed a pattern of physical therapist responsibility common to all groups. Patient care, either direct or indirect, was the common denominator, with a wide variety of other duties assuming major or minor importance, depending on the agency's program. Other responsibilities considered were: 1) knowledge and ultilization of community resources so that continuity of patient care will be assured—this may be a shared responsibility with other staff members— 2) professional education, 3) parent education, 4) public education, with fund-raising being an indirect result for voluntary agencies, 5) public relations, 6) establishment and development of physical therapy programs, 7) consultation service, 8) supervision of clinical experience for students, 9) recruitment of personnel into the public health field.

The question of how the physical therapy program in these agencies differs from that in a hospital was answered in part by discussing the following points of differences. In a community agency, a physical therapist

1) has more contacts with a variety of professional people in health, education, and welfare in providing patient care;

2) has a relationship with the families and patients which requires that she know community resources and recognize family and patient problems in order to meet as many of their needs as possible;

3) assumes a greater responsibility in seeing that patients return to the physician for medical reevaluation;

4) assumes a responsibility in planning for continuity of patient care, case finding and correct referral;

5) needs to have had supervised experience, especially in home care programs and, when working in facilities as the only physical thera-

This résumé of a workshop, presented at the American Physical Therapy Association Conference in St. Louis, June 1955, was compiled by Clara Arrington, Physical Therapy Consultant, Children's Bureau, Department of Health, Education, and Welfare, Washington, D. C.; Florence Linduff, Chief, Physical Therapy, Veterans Administration, Washington, D. C.; and Emily Mueller, Arthritis Rehabilitation Instructor, Eastern Pennsylvania Chapter, Arthritis and Rheumatism Foundation, Philadelphia.

pist, needs more knowledge in adaptive technics;

6) needs a greater ability to recognize and prevent deformities and disabilities;

7) needs more detailed information about community agencies, methods of communication, methods of coordination of services, and public and interpersonal relations.

In addition,

8) The frequency of medical supervision of the patient and medical direction of the physical therapist vary from weekly, monthly, quarterly to a yearly basis.

9) More skill is required in teaching the patient and the family to carry on their own treatment in the home.

It was necessary to divide the fourth question into its two components: first, what special knowledge, skills or abilities are required of physical therapists working in a community agency; and second, how are these acquired. In addition to the qualities of ingenuity, tact, patience and initiative, which every physical therapist must have, the group listed several special qualifications necessary for physical therapists to function effectively in community agencies. Of primary importance is possessing a concept of public health, i.e., knowledge and awareness of community organization and resources. Obviously, the physical therapist must make effective use of these resources. In addition, there must be acceptance of the contributions of and close cooperation with other professional personnel who are also working toward the total rehabilitation of the patient. The group further agreed that a wealth of professional knowledge and experience plus the ability to instruct were essential for a physical therapist in a community agency. This includes the ability to interpret his work to agency administration, patients, the public, and other professional people through oral and written communication.

The foundation for these attributes should be acquired first of all in the schools of physical therapy, both in the didactic work and in clinical practice through affiliation with community agencies. Inservice training, well planned and supervised by the employing agency, can further broaden these concepts and develop these skills. Chapters can augment such training through their programs, institutes, and workshops in such areas as interpersonal relations, methods of communication, and state and local resources.

During the course of the discussion, several points were brought out which the group felt should be brought to the attention of the Association's Department of Professional Services. One of these dealt with treatment fees, and it was decided that physical therapists have a responsibility to 1) determine the costs of physical therapy for the agency, 2) collect fees according to agency policy when so directed, 3) observe the home situation and assist in the adjustment of fees.

Fund-raising and the use of physical therapists in these drives also provoked some discussion. The consensus was that physical therapists should not be exploited for publicity purposes. Any participation by physical therapists in fund-raising activities should be only on an educational level to interpret physical therapy to the public and for recruitment. As private citizens we all may assume fund-raising responsibilities without using our profession for publicity. Physical therapists in voluntary agencies are being asked to wear additional patches on their uniforms to identify them as employees of an agency or the agency receiving funds from a collection drive. The consensus of the group was that the Association emblem should be worn, that some identification of the employing agency was permissible but that professional people should not be expected to wear emblems purely for publicity purposes.

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Editorial

With this issue the *Physical Therapy Review* presents a "new look" in its cover both in color and design. It is the earnest hope of the Editorial Board that the subscribers will be pleased with the change. It stands, we feel, as one more milestone of progress in the growth of the only journal devoted exclusively to the interests of physical therapists throughout this country.

Such changes always invite reflection on the historical factors from which continued growth has come. The *Review*, now in its fourth decade of publication has long been a mirror of the parallel progress of the profession of physical therapy, and a brief review of the changes and trends it has reflected seems appropriate at the beginning of the year, a time so often reserved for taking inventory.

The *Review* was founded in 1921 as a small, blue (later grey) journal of some sixteen pages. It is significant to note here that in the matter of color we have come full cycle. At first it appeared but four times a year and represented the earnest efforts of a few members working entirely in their spare time. Today it is somewhat overwhelming to attempt to visualize how, while devoting the major portion of time to a patient-care job, these early workers found time to solicit material, edit it, arrange for printing, handle the myriad business details and still get the *Review* out to the members.

Not only was this accomplished, but it was done so well that in 1928 the number of issues was increased from four to six annually. This change most certainly was an outgrowth of the increase in professional physical therapists, most of whom knew and understood the necessity of writing for and about their work. This fact, recognized in the early years of the *Review*, still stands as one of our basic cornerstones of organization and professional structure.

1946 was also a year of change when, for the first time the familiar grey cover was replaced by the now well known maroon and cream. Still published only every other month, it fast became necessary to the advancement of knowledge for every member of the Association.

The increasing importance it played, along with the growing sense of responsibility by members to add information to the field, soon forced one more big change. In 1949 the *Review* for the first time became a monthly publication.

Editorial

It should be repeated that throughout this era the work was still primarily volunteer and not until 1933 did the beginnings of a permanent business staff appear. First a business manager and later a managing editor were added as the work became greater and finally, in 1938, the first office was established.

In 1954 the Editorial Board which had consisted of four members was increased to six in order to expand the services of the *Review* to better meet the members' needs. The scope of articles and services has also undergone expansion in the hope that the *Review* will continue as a potent force in the progress of the profession. Increasingly good material representing the rising levels of research, clinical practices and basic science knowledge has combined to improve both the quality and quantity of the contents.

And so today we once again present a major change in the appearance, confident that it marks a new level of improvement and that the *Review* will continue to serve the profession as its spokesman throughout the world.

Marriages

Peggy Johnson, of Albany, N. Y., to Andrew Carroll, Albany.

Genevieve Killins, of San Francisco, Calif., to J. R. Dieter, Waco, Tex.

Jennie Marciniec, of Southington, Conn, to Anthony L. Urillo, Southington.

Elizabeth A McBane, of Washington, D. C., to Willard K. Hall, Takoma Park, Md.

Marian Meyers, of Madison, Wis., now Mrs. Marian M. Accetturo, Chicago.

Rachael Millard, of Fresno, Calif., to L. A. Pattillo Jr., Lubbock, Tex.

Mary Ellen Moore, of North Haven, Conn., to William O. Burgess, New Haven, Conn.

Margaret Norstedt, of El Paso, Tex., now Mrs. Margaret N. Schubert, New York, N. Y.

Jeanne Paden, of Glenview, Ill., now Mrs. Jeanne P. Reed, Glenview.

Shirley Rogers, of Elyria, Ohio, now Mrs. Shirley R. Saddler, Elyria.

Orpha Rosado, of Rio Piedras, P. R., now Mrs. Orpha R. Latoni, West Palm Beach, Fla.

Nancy Schumacher, of Dallas, Tex., now Mrs. Nancy S. Blanchard, Dallas.

Joan Scott, of Pelham Manor, N. Y., to Bertrand T. Laydon, Pelham Manor.

Winifred Jean Schultz, of Ellsworth AFB, S.D., to Harrison Gill, Ellsworth AFB.

Joseph B. Smolens, of New York, N. Y., to Susan Feldman, Bronx, N. Y.

Gertrude Stork, of McFarland, Kansas, now Mrs. Gertrude S. Gonsalves, Reno, Nev.

Ruth Stucki, of Helena, Mo., now Mrs. Ruth S. Parson, Kansas City, Mo.

Katherine B. Sumner, of Washington, D. C., now Mrs. Katherine S. Campbell, Alexandria, Va.

Alice B. Bond, of Valatie, N. Y., now Mrs. Alice B. Smith, State College, Pa.

Barbara Bridgeland, of Madison, Wis., to Charles W. Crowley, Rockford, Illinois.

Norma Curcio, of Newell, Pa., now Mrs. Norma C. Monath, Newell.

Ann Fusoni, of Washington, D. C., now Mrs. Ann F. Palmer, Washington.

Prudence Hall, of Falmouth, Mass., to Karl Ryder, Falmouth.

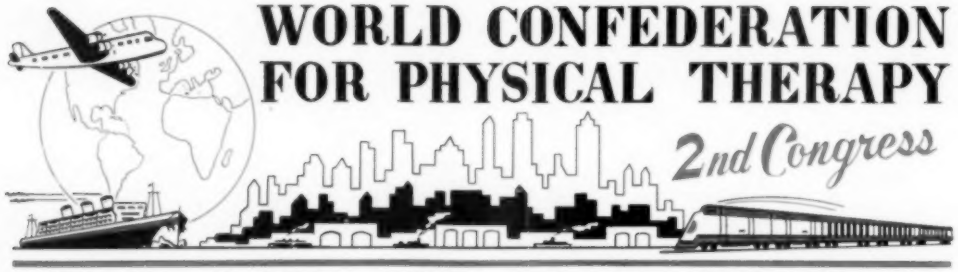
Georgianna Harmon, of Stanford, Calif., now Mrs. Georgianna H. Ferrari, Stanford.

Doris L. James, of Norfolk, Va., now Mrs. Doris J. Duclos, Cambridge, Mass.

Emilie Johnson, of Los Alamos, N. M., to Thomas Hines, Los Alamos.

Member's Paper in October Publication

The October, 1955 issue of *Hospital Management* includes a condensation of the paper which Florence L. Phenix, APTA member and Associate Secretary of the Health Division Community Welfare, Milwaukee, Wisconsin, read at the 1954 Physical Therapy Institute. The paper was published in its entirety in the May, 1955 issue of the *Physical Therapy Review* under the title "Coordination of Services."



WORLD CONFEDERATION FOR PHYSICAL THERAPY

2nd Congress

JUNE 17—23, 1956 · HOTEL STATLER · NEW YORK, N.Y.

Intermediate Program

Sunday, June 17

11:00 A.M. — Religious Services

2:00 P.M. — 5:00 P.M. Registration

5:00 P.M. — 8:00 P.M. Reception

Monday, June 18

8:00 A.M. — 9:30 A.M. Registration

10:00 A.M. — 11:30 A.M. Opening Ceremony

General Session

2:00 P.M. — 3:00 P.M. Panel Discussion: **The Role of the Physical Therapist in the Evaluation Studies of Poliomyelitis Vaccine Trials**

Thomas Francis, M.D., Chairman, Department of Epidemiology, School of Public Health, University of Michigan, Ann Arbor, Michigan

Lucy Blair, Consultant, Professional Services, American Physical Therapy Association

Miriam Jacobs, Instructor, D. T. Watson School of Physiatrics, Leetsdale, Pennsylvania

3:30 P.M. — 4:30 P.M. **Cerebral Palsy — Similarities and Differences in Methods of Treatment** — Edna Blumenthal, Director of Rehabilitation, North Carolina Cerebral Palsy Hospital, Durham, North Carolina

6:00 P.M. — 9:00 P.M. Boat Trip Around Island of Manhattan, Host: New York Chapter

Tuesday, June 19

General Session

9:00 A.M. — 10:00 A.M. **Health, a Strong Force for World Understanding — The Role of the Physical Therapist** — Howard A. Rusk, M. D., Director, The Institute for Physical Medicine and Rehabilitation, New York University—Bellevue Medical Center

10:30 A.M. — 11:00 A.M. **The Physical Therapy Student — His Selection and Education** — Catherine Worthingham, Ph.D., Director, Department of Professional Education, National Foundation for Infantile Paralysis, New York

11:00 A.M. — 11:30 A.M. **The Physical Therapist — His Professional and Social Responsibilities** — Colonel Harriet S. Lee, Chief, Army Medical Specialist Corps, Washington, D. C.

Concurrent Sessions

Session A

2:00 P.M. — 4:30 P.M. Panel discussion: **Prosthetics — Research and Developmental Aspects and Training**

Charles O. Bechtol, M.D., Associate Professor of Surgery and Chief of the Division of Orthopedic Surgery, Yale University, New Haven, Connecticut

Henry H. Kessler, M.D., Medical Director, Kessler Institute for Rehabilitation, West Orange, N. J.

Eugene F. Murphy, Ph.D., Chief, Research and Development Division, Prosthetic and Sensory Aids Services, Veterans Administration, New York

Earl A. Lewis, Assistant Engineering Scientist, College of Engineering, New York University, New York

Session B

2:00 P.M. — 4:30 P.M. Selected papers will be presented from member organizations of the World Confederation for Physical Therapy.

7:30 P.M. — Canadian Reception

Wednesday, June 20

Concurrent Sessions

Session A

9:00 A.M. – 10:00 A.M. **The Physical Therapist on the Obstetrical Team** — Eileen Montgomery, Physiotherapist-in-charge, Bristol Maternity Hospital, Bristol, England

10:30 A.M. – 11:00 A.M. **Principles of Underwater Exercise** — Mary E. Kolb, Instructor, D. T. Watson School of Physiatrics, Leetsdale, Pennsylvania

11:00 A.M. – 11:30 A.M. **The Use of Reaction Patterns in the Training of Adult Patients with Hemiplegia** — Signe Brunnstrom, Consultant in Amputee Training, Institute of Physical Medicine and Rehabilitation, New York University—Bellevue Medical Center, New York

Session B

Symposium: Body Alignment as Related to Activity

9:00 A.M. – 9:30 A.M. **The Contribution of the Physical Therapist to the Child in School** — Ester Ibsen Bak, Copenhagen, Denmark

9:30 A.M. – 10:00 A.M. **The Effect of Physical Therapy on Pathological Postures** — Marta Lindstrom — Göteborg, Sweden

10:30 A.M. – 11:00 A.M. **Posture and Pain** — Molly Turner, Department of Physical Medicine, University College Hospital, London, England

11:00 A.M. – 11:30 A.M. **Exercise for Spondylitis Deformans** — G. Best, M.D., Orthopedic University Clinic, Cologne, Lindenthal, Germany

11:30 A.M. – 12:00 Noon **Posture Education in Finland** — Saiman Tawast-Rancken, M.D., Lecturer, University of Helsinki

2:00 P.M. – 4:30 P.M. General Meeting, World Confederation for Physical Therapy

7:00 P.M. – 7:45 P.M. Reception

8:00 P.M. – Banquet

Thursday, June 21

General Session

The Community Rehabilitation Program

9:00 A.M. – 9:30 A.M. **The Patient As a Person** — Earl L. Koos, Ph.D., Professor, Family Life Education, School of Social Welfare, Florida State University, Tallahassee, Florida

9:30 A.M. – 10:00 A.M. **A Home Care Program** — Mary Martin, Supervisor of Physiotherapy, Canadian Arthritis and Rheumatism Society, Toronto, Canada

10:30 A.M. – 11:00 A.M. **Convalescent Program for the Severely Disabled** — Laura K. Smith, Director of Physical Therapy Education and Dorothy Iddings, Clinical Supervisor, Southwestern Poliomyelitis Respiratory Center, Houston, Texas

11:00 A.M. – 11:30 A.M. **Utilization of Community Resources for Rehabilitation** — Hazel Furscott, Former Director, May T. Morrison Center for Rehabilitation, San Francisco, California

11:30 A.M. – Summary — Dr. Koos

Concurrent Sessions

Session A

Selected Testing and Evaluation Procedures

2:00 P.M. – 2:30 P.M. **Joint Measurement: Technics and Recording Methods** — Margaret Moore, Chief, Department of Physical Therapy, North Carolina Memorial Hospital, University of North Carolina, Chapel Hill, North Carolina

2:30 P.M. – 3:00 P.M. **Manual Muscle Testing: Development and Current Use** — Marian Williams, Assistant Professor of Physical Therapy, Stanford University, California

3:30 P.M. – 4:00 P.M. **Application of Electro-Myodynagraphic Methods to Clinical Evaluation of Muscular Dynamics** — Willis C. Beasley, Ph.D., Director, Biophysics Research Laboratory, Bethesda, Maryland

4:00 P.M. – 4:30 P.M. **Functional Testing: Development and Current Use** — Edith Buchwald Lawton, Director, Rehabilitation Courses for Physical Therapists, Institute for Physical Medicine and Rehabilitation, New York University — Bellevue Medical Center, New York

Session B

2:00 P.M. – 4:30 P.M. **Physiological Basis of Electrical Stimulation of Human Muscle and Its Clinical Application** — Harry D. Bouman, M.D., Professor of Physical Medicine, University of Wisconsin Medical School, Madison, Wisconsin
Kathryn J. Shaffer, Assistant Professor, Department of Physical Medicine, University of Wisconsin

Friday, June 22

Concurrent Sessions

Session A

Symposium: Bracing and Adaptive Devices for Neuromuscular Disorders

9:00 A.M. – 10:00 A.M. **Bracing: Purpose, Fitting and Development** — Robert L. Bennett, M.D., Medical Director, Georgia Warm Springs Foundation, Warm Springs, Georgia

10:30 A.M. – 11:30 A.M. **Training the Patient to Use Devices** — Hazel Royall Stephens, Chief, Functional Therapy, Georgia Warm Springs Foundation

Session B

9:00 A.M. – 9:20 A.M. **Research by Physiotherapists in Electromyography** — Enid M. Gotts, Principal, New Zealand School of Physiotherapy, Dunedin, New Zealand

9:20 A.M. – 9:40 A.M. **Physical Therapy in Thoracic Surgery** — Gladys M. Storey, Physiotherapist-in-charge, Thoracic Unit, St. Thomas' Hospital, London, England

9:40 A.M. – 10:00 A.M. **Physical Therapy in Acute Respiratory Poliomyelitis** — Ella Andersson, Copenhagen, Denmark

10:30 A.M. – 10:50 A.M. **Cerebral Palsy: Evaluation of Results Obtained from Physical Therapy** — Ester Lunning, Chief Physical Therapist, Orthopedic Hospital, Copenhagen

10:50 A.M. – 11:10 A.M. **Stiffness and Flexibility** — Georges Dreano, France

11:10 A.M. – 11:30 A.M. **Practice of Physical Therapy Among the Blind** — Andre Nicolle, President, National Committee of Masseurs and Kinesitherapists of France

Session C

9:00 A.M. – 11:30 A.M. Educational Seminar

General Session

2:00 P.M. – 2:30 P.M. **Expanding Opportunities of The World Confederation for Physical Therapy** — Donald V. Wilson, Secretary General, International Society for Welfare of Cripples, New York

2:30 P.M. – 3:00 P.M. **Progress Through Lay and Professional Cooperation** — Basil O'Connor, President, National Foundation for Infantile Paralysis, New York

3:30 P.M. – 4:30 P.M. Closing Ceremony

Film Theatre

Beginning Tuesday, June 19, there will be a daily schedule of films of professional interest from abroad and this country.

Exhibits

There will be many technical and scientific exhibits which will show the latest developments in professional technics and equipment.

Study Visits

Study visits will be scheduled to selected clinical centers.

Social Events

The calendar of social events is not yet complete. See program for those scheduled to date.

Dress

Informal except for the reception and banquet at which it is hoped that evening dress will be worn.

Educational Courses

The following post-Congress courses have been scheduled:

Boston University-Sargent College, Department of Physical Therapy, June 25-July 6, Introductory Course in Proprioceptive Neuromuscular Facilitation Technics

Kessler Institute, June 25-27, Rehabilitation Procedures as Applied to Amputees, Paraplegics and Quadriplegics

University of Connecticut, School of Physical Therapy, June 27-29, Bio-Mechanics of the Upper Extremity. Prosthetics and Problems of Upper and Lower Motor Neuron Lesions.

Post-Congress Tours

Two all-expense five day coach tours — one to Boston and one to Washington which combine professional visits with sightseeing. Cost $88.00 which includes transportation service, lodging, meals and tours.

Membership Fees

Until February 1, 1956		After February 1, 1956	
Full Members	$10.00	Full Members	$12.00
Student Members	$ 5.00	Student Members	$ 6.00
Social Associates	$ 8.00	Social Associates	$10.00

Enrollment

Membership fees and all requests for further information should be directed to World Confederation for Physical Therapy, 1790 Broadway, New York 19, N. Y.

Members who have enrolled but who are subsequently unable to attend may have their fees refunded less 20 per cent, provided cancellations are received by May 1, 1956.

Hotel Reservations

Requests for hotel reservations should be sent directly to the Hotel Statler, New York, N. Y. Be certain to mention that you will be attending the Congress.

New York—the Empire State

Vacationists paradise — The Empire State — where every possible facility for the enjoyment of visitors has been developed to such an extent that the two graceful ladies who flank the State seal seem not only to represent Liberty and Justice but Hospitality as well.

A traveller taking one of the many parkways that give distinction to New York's more than 86,000 miles of roads would find that these travel routes follow the waterways, wind around towering mountains, and lead to many points of interest.

The Hudson, a river unequaled in legend and beauty, represents the past and present in American life. The Hudson highlands where the mountains seem to advance and retreat, and where the color ranges from purple to black, dominate the west side of the river.

Here, easily reached from Manhattan by bus or automobile, is West Haverstraw, the site of the New York State Rehabilitation Hospital and, another institution of interest, the State Reconstruction Home, a hospital for the care of crippled and deformed children.

Hyde Park, in the estate country, is also only a short distance from New York City. The name in American newsprint is as important as that of London because it is the birthplace of the late Franklin Delano Roosevelt. His home, which has much of the restrained elegance of an eighteenth-century French chateau, is visited by thousands of persons each year.

Not far from Hyde Park is the U. S. Military Academy of West Point with its 15,000 acre reservation. Founded in 1802, the grand and dignified masses of Gothic style buildings achieve, by some medieval magic, a remarkably satisfying military character. While June week with its graduation exercises and colorful parades climaxes the year's events, parades and reviews are scheduled year round.

Accessible within a few hours travel from New York City are Bear Mountain and Storm King Mountain which rise steeply above the Hudson. Both afford magnificient views of the river. Bear Mountain with its innumerable lakes is one of the most popular year-round recreation centers in the state and the Bear Mountain Inn provides excellent accommodations for those who wish to linger in this setting of beauty.

Just north of Manhattan is Poughkeepsie which boasts the first chartered school of its kind in America, the Vassar College for Women. In this area are located many large estates, one of the most famous being Locust Grove, the 100-acre estate that was the home of Samuel F. B. Morse, inventor of the telegraph.

Above Poughkeepsie on the west side of the Hudson, approximately 100 miles from New York City is Albany, the State Capital, and directly across the river is Fort Crailo which was built in 1704. This famous old fort is also known as the "Yankee Doodle House," for it was here that a British army surgeon wrote the derisive words of the now famous "Yankee Doodle Dandy," while watching the provential militia drill in the eighteenth century.

Not far from Albany there is a 1,300 acre reservation known as Saratoga Spa, famous site of a major revoluntionary battle. Saratoga, the scene of internationally famous horse races, is noted for its two race tracks, one for flat races

NYSPIX Commerce

Hudson River looking north from Victory Monument, West Point.

NYSPIX Commerce

Bear Mountain Bridge and Day Boat

and the other for trotting. The racing season lasts from June through August. Saratoga also offers summer theater with a program studded with Broadway stars.

Beyond Saratoga, the traveller finds the vastness of the Adirondack Mountains, whose forests cover an area as large as the State of Connecticut. In the foothills lie Lake George, an all-year sports center where in recent years winter sports have been developed on a large scale, and Ticonderoga which is on the neck of land connecting Lake George and Lake Champlain. U. S. history was made at Fort Ticonderoga, but today the community is known as a manufacturing center. There is an excellent motor road up White Face Mountain, the fourth highest of the Adirondacks. Lake Placid, surrounded by the highest Adirondack peaks, well deserves its reputation as a summer and winter sports community. Nearby, Saranac Lake maintains a world famed health resort.

From Albany westward is the historic Mohawk Valley which forms an inland route rich in tradition of the country's early days. This valley region is bound into an unsurpassed unit by a chain of cities which includes Albany, Syracuse and Schenectady. The latter is often referred to as the "city that lights and hauls the world," for here are located the home plants of the General Electric Company and the American Locomotive Company. The Mohawk Valley can also be proud of the most fertile farming areas in the state and of the famous Finger Lake Section with its beautiful lakes and tree-covered mountains. In this area is Cooperstown, home of James Fennimore Cooper, author of the "Leather Stocking Tales," and of Abner Doubleday who founded the game of baseball, America's leading sport.

Northwest are Rochester on Lake Ontario, the third largest city in the State, and Buffalo, with its tremendous shipping terminal on Lake Erie. A few miles north is the magnificent Niagara Falls that attract more than 1,500,000 visitors annually. The Niagara river connects Lake Erie with Lake Ontario, two of the Great Lakes, forming part of the New York State boundaries.

Within the state can be seen a wide variety of scenery, the ocean and inland ports, virgin forests, snow-topped mountains, fertile farm lands, and great industrial cities. New York well deserves its reputation as "The Empire State," and is fortunate in its natural endowments which make it a wonderful vacationland.

1956 APTA Meetings

The 1956 House of Delegates meeting will be held on Saturday, June 16, in order that there will be no conflict with World Confederation program and activities. Delegates must register on Friday evening, June 15, from 7:30 to 10:30 and on Saturday morning from 8:00 to 9:00. It is urged that delegates make every effort to register on Friday evening. Election of National officers will be at noon on Saturday, June 16. All members are welcome and urged to attend the House of Delegates meeting.

Other American Physical Therapy Association meetings will be limited to those of the School Section, the Self-Employed Section, and Physical Therapists in Official Crippled Children's Program and Public Health. These groups will hold all day sessions on Saturday, June 23.

Speakers at Second Congress

COLONEL HARRIET S. LEE is Chief of the Army Medical Specialist Corps, Office of the Surgeon General, Department of the Army, Washington, D. C. Colonel Lee is a graduate of Ohio Wesleyan University and was an instructor in physical education in Denver, Colorado, and at MacMurray College for Women in Illinois. She entered the Army Physical Therapy Course at Walter Reed Hospital, Washington, D. C., and served as a staff physical therapist there. Colonel Lee became associated with the University of Colorado Medical Center and in 1942 resumed her professional duties with the Army Medical Service at Fitzsimons Army Hospital, Denver, and was subsequently appointed chief physical therapist.

Colonel Lee has served as Chief of the Physical Therapy Branch in the Office of the Chief Physical Medicine Consultant to the Surgeon General and in her present position is in charge of all dietitians, physical therapists and occupational therapists of the Army. Colonel Lee's topic on the Congress program will be, "The Physical Therapist—His Professional and Social Responsibilities".

ESTER LUNNING, is Head of the Cerebral Palsy Department and Chief Physical Therapist, Orthopedic Hospital, Copenhagen, Denmark. Miss Lunning is a graduate of the University of Copenhagen and received her physical therapy education in Copenhagen. Miss Lunning was formerly on the staff at Dr. Sandoz' Clinic for Physical Treatment in Paris. She attended a course at Children's Rehabilitation Institute, Baltimore, Maryland, in 1950, and worked with cerebral palsy patients at several hospitals in the United States in 1951.

Miss Lunning has served as consultant to the Cerebral Palsy Association of Denmark. She is the author of "Will a Cerebral Palsy Patient Be Able to Become Independent?" Miss Lunning will speak on the subject, "Cerebral Palsy — Evaluation of Results Obtained from Physical Therapy Treatment."

ENID M. GOTTS, Principal, New Zealand School of Physiotherapy, Dunedin, New Zealand, received her physical therapy education at Guy's Hospital, London, England. She qualified as a Teacher of Electrotherapy in 1931. She was a teacher of this subject at Guy's Hospital for several years and was in charge of the Electrotherapy Department for a year.

In 1934 Miss Gotts went to New Zealand as senior assistant in the New Zealand School of Physiotherapy and assumed her present position in 1946. She is a past president of the New Zealand Society of Physiotherapists, Inc., a delegate to the Dominion Council of the Society, and a member of the Physiotherapy Board of New Zealand.

Miss Gotts is the author of "Notes on Construction of Apparatus Used in Electrotherapy and Actinotherapy" and will present a paper entitled "Research by Physiotherapists in Electromyography Apparatus and Technic."

Endorsing Organizations

American Academy of Orthopaedic Surgeons
American College of Surgeons
American Hospital Association
American Neurological Association
American Orthopaedic Association
American Public Health Association
Catholic Hospital Association of the United States and Canada
Federaton of Jewish Philanthropies of New York
International Council of Nurses
International Poliomyelitis Congress
International Society for the Welfare of Cripples
National Foundation for Infantile Paralysis
National Rehabilitation Association
World Veterans Federation

Post Congress Educational Courses

University of Connecticut

The School of Physical Therapy at the University of Connecticut announces a course pertaining to Upper Extremity Bio-Mechanics to be presented at the Continuing Education Center the week of June 25, 1956, immediately following the Second Congress of the World Confederation for Physical Therapy to be held in New York City.

The course will include upper extremity prosthetics and problems of upper and lower motor neuron lesions. Charles Bechtol, M.D., Professor of Orthopedics at Yale University and Chief of the Orthopedic Department at Grace-New Haven Hospital, assisted by a physical therapist, an occupational therapist, and a prosthetist will give consideration to: (1) the procedures used in fabricating and fitting the latest types of functional artificial arms; (2) the principles of artificial arm operation; (3) the methods used in checking and evaluating their functions; (4) the technics most effective in teaching amputees to use these new type arms; (5) the therapy procedures necessary to prepare the stump for its role; and (6) the implications of these new type arms to the problems of rehabilitating upper extremity amputees.

Signe Brunnstrom, Consultant in Amputee Training, Institute of Physical Medicine and Rehabilitation, New York University-Bellevue Medical Center, New York City, will correlate a study of the problems of upper and lower motor neuron lesions particularly relating to (1) the upper extremity and its relation to the tonic neck reflexes and the labyrinthian impulses; (2) peripheral nerve injuries, especially those in the shoulder girdle; and (3) the training program for the hemiplegic patient.

Expenses for the course will include a fee of $80.00, which completely covers tuition, board, room, and printed material. Ten dollars, which are not refundable, must be sent with the application.

Enrollment will be limited to 185. Details regarding the course outline, faculty, and travel arrangements will be sent at a later date to those who are accepted for enrollment. Application forms will be found on page 10 of this issue.

Boston University Sargent College

The Boston University Sargent College, Department of Physical Therapy announces an Introductory Course in Neuromuscular Facilitation Techniques to be given under the direction of Margaret Knott, Head Physical Therapist, California Rehabilitation Center, from June 25, to July 6, 1956.

The course will include instruction in the theory and practice of technics, and an analysis of muscle function in patterns of facilitation. Opportunity will be given for practice under supervision and observation of treatment procedures. The course may be taken for two semester hours credit at a cost of $40.00, or it may be taken without academic credit at a cost of $30.00. Room and breakfast will be provided in the college dormitory for $26.00.

The closing registration date will be June 1, 1956. Registration will be limited to 20 qualified physical therapists who are members of the American Physical Therapy Association, or of member associations of the World Confederation for Physical Therapy. Students will be selected as applications are received, but the right to select students on a geographical basis is reserved. Students should wear slacks. Each registrant will be sent mimeographed material for study before the course begins.

Those interested should apply to Professor Adelaide L. McGarrett, Physical Therapy Director, Boston University Sargent College, 6 Everett Street, Cambridge 38, Massachusetts. Please indicate whether or not academic credit is desired, and whether room and breakfast are desired.

The Kessler Institute for Rehabilitation—June 25-27, 1956

The Kessler Institute announces a three-day post-conference program to discuss rehabilitation procedures as applied particularly to amputees, paraplegics, and quadriplegics. The program will be presented by institute staff and consultants

and is open to conferees of the Second Congress, World Confederation for Physical Therapy.

Program outline:

Monday, June 25

Philosophy of the Rehabilitation Program.
Clinical Application with Demonstration.
Orientation to Physical Therapy Program.

Tuesday, June 26

Paraplegic program—training and bracing.

Wednesday, June 27

Amputee program—pre-prosthetic and prosthetic training for upper and lower extremity amputees.

The fee is $10.00. Registration is limited to twenty-five.

Letters of application to be sent to:

Ruth Dickinson, Director
Physical Therapy Department
Kessler Institute for Rehabilitation
West Orange, New Jersey, U.S.A.

School Section Notice

A business meeting of the School Section will be held on Saturday morning, June 23, 1956.

At the School Section meetings held in St. Louis, discussion included an evaluation of the purposes of the Section. Because of the differences of opinion expressed, it was decided to establish a committee whose objectives would be

1. to determine whether the School Section is meeting its stated objectives.
2. to determine whether the Rules of Government of the School Section need revision and if so, make suggestions as to the necessary changes.

The Committee would appreciate suggestions from the membership and is soliciting expressions of opinion. Please send your ideas to the Chairman of the Committee, c/o Physical Therapy Department, University of Southern California, Los Angeles 7, California.

CHARLOTTE ANDERSON, *Chairman*
LUCILLE DANIELS
MIRIAM JACOBS
HELEN KAISER
MAXINE SCHULDT
AGNES SNYDER
DOROTHY HEWITT (*exofficio*)

Physical Therapists in Official Crippled Children's Program and Public Health

Physical therapists working in the Crippled Children's Services, as well as all those working in the public health field, will meet on Saturday morning, June 23, at the Statler Hotel.

Tentative program plans include a report by a worker in one of the foreign public health programs. It is also planned to have a review of programs in some of our own states.

The formation of a Public Health Section is under consideration. There must be a minimum of fifty members to have a section approved. Action may be taken at this meeting.

Watch your *Review* for future notices regarding this meeting.

Co-Chairmen

SARAH C. JOHNSON
Physical Therapy Supervisor
Division of Crippled Children
Connecticut Department of Health

MARIAN H. PRATT
Consultant Public Health Nurse—Physical Therapy
New York State Department of Health

Your Chapter or District Newsletter Can Stimulate Interest in Your Recruitment Progam

Resolve to encourage during 1956 the active participation of every member in your recruitment program. Utilize your chapter or district newsletter to enlist their cooperation. Publish suggestions and easy-to-use guides for recruitment projects and ask every member to do his or her share to recruit students in the area in which he or she works. When more help is needed write to the National Office for suggestions.

Copies of the New Physical Therapy *Record* Are Available

For State Health Fairs and other gatherings of the general public for which you will need an informational piece on physical therapy, you may plan to distribute a tabloid-size newssheet titled "The Physical Therapy *Record*." We hope that a copy will be on display at your next chapter or district meeting. Make arrangements to obtain copies from your chapter or district president or recruitment chairman.

Association Activities

Mildred Elson Resigns

It is with deep regret that I announce the resignation of Mildred Elson as Executive Director of the American Physical Therapy Association to become effective following the Second Congress of the World Confederation for Physical Therapy. Miss Elson has made a truly significant contribution during the past eleven years as Executive Director; many additional years of service as Editor of the *Review* and Chairman of the Committee on Education. Her resignation is a milestone in the history of our Association which will be difficult to pass. Although she will no longer be working for us we can take courage in the fact that she will be continuing her interest and will work with us as a member. I feel confident, as I know the membership will, that the foundation which Miss Elson has laid for us will enable her successor to travel in but one direction—ahead to a bigger, better, and stronger American Physical Therapy Association.

Prior to the selection of her successor the Board of Directors has authorized and will appoint an ad hoc structure study committee to reexamine and make recommendations on the duties and responsibilities of the National Office staff, the Advisory Committees of Professional Education, Professional Services, Chapter Activities and the *Review*.

MARY E. NESBITT
President

Contributions

Recent contributions to the Second Congress fund:

Eastern District—Pennsylvania	$200.00
New Mexico Chapter	18.00
Georgia Chapter	67.00
Vermont Chapter (additional contribution)	2.00
Wyoming Chapter	14.00
Mary McMillan	25.00
Colorado Chapter	86.00
South Carolina Chapter	25.00
Southeastern Texas District	35.13
Southwestern Polio Center	3.50
Dr. Paul R. Harrington	10.00
Northeastern District Ohio Chapter	89.00

Total to date from twenty-three chapters and districts, and individual members—$2,680.59.

Mr. Treth deVerelle, member of the Association and of the Eastern District of the Pennsylvania Chapter since 1933 passed away in June, 1955. Mr. deVerelle was a former chapter secretary and served as chairman of several committees. At the time of his death he was in private practice in Philadelphia.

Self-Employed Section in Membership Drive

All active American Physical Therapy Association members interested in becoming members of the Self-Employed Section are urged to contact Harold Feldman, Corresponding Secretary, 5900 Van Nuys Blvd., Van Nuys, California, as soon as possible.

The purpose of the Self-Employed Section of the APTA is to represent the self-employed physical therapists and to serve as their spokesman within the framework of the American Physical Therapy Association; to establish and promote recommended standards of physical therapy service as provided by full or part time, self-employed physical therapists.

National Study Committees are being formed by Robert Teckemeyer, 835-5th Street, Santa Rosa, California, Recording Secretary, to investigate many of the unanswered questions of the membership such as:

Malpractice Insurance Needs, Ethical Public and Professional Relations, Judicial and Legislative Needs, plus many others.

Everyone interested in participating in one of the study committees of this Section should contact Mr. Teckemeyer.

Watch the *Review* for New York Conference plans and announcement of Section meetings.

ROBERT G. DICUS *Chairman*,
Self-Employed Section

Association Meetings

Initial information on 1956 Association meetings is included in the World Confederation for Physical Therapy program in this issue of the Review (see page 58). Watch for further announcements in subsequent issues.

Physical Therapy Review Offers Cumulative Index

Readers of the *Physical Therapy Review* have long felt a need for a ready reference to the many valuable scientific articles which have been published in the *Review* and are of permanent value for teaching and resource material.

During the past summer Helen Hislop, Assistant Editor of the *Review*, volunteered her services to compile a cumulative index. The Association is extremely grateful to Miss Hislop for this outstanding contribution.

In compliance with a decision of the Editorial Board the Index covers Volumes 20 to 34 for the years of 1940 through 1954. It is now available at $1.00 per copy in an attractively bound paper covered booklet. This will be supplemented from time to time by compilations for succeeding years, and is in addition to the annual index found in the December issue of each volume of the *Review*.

The scope of its value will be readily recognized but may be further pointed out by the fact that 36 articles are listed under cerebral palsy, 12 under hemiplegia, 12 under peripheral nerve injuries, 50 under poliomyelitis and 31 under rehabilitation.

Copies will be sent on receipt of your order and payment of $1.00 to:

The American Physical Therapy Association
1790 Broadway
New York 19, New York.

Educational Consultant Appointed

The Board of Directors of the American Physical Therapy Association announces the appointment of Sarah S. Rogers as Educational Consultant to replace Dorothy R. Hewitt whose resignation has been accepted effective July 1, 1956.

Miss Rogers will assume her duties on May first. Her unexpired term as a Director of the Association will be filled in the election to be held in June. Her experience in the field of physical therapy education furnishes an excellent background for her new position. She was technical director of the school of physical therapy at Childrens Hospital, Los Angeles from 1947 to 1951. In 1952 she became associate Technical Director of the newly established school of physical therapy at Charity Hospital, New Orleans and was Technical Director from July 1953 until December 1955 when she resigned.

SARAH S. ROGERS

Miss Rogers holds a Bachelor of Science degree from the College of William and Mary and a Master of Arts degree in Education from George Washington University. Prior to obtaining her physical therapy certificate at the Army and Navy General Hospital she taught physical education as a graduate of Sargent College, at Mary Washington College, and the Norfolk Division of the College of William and Mary.

Since becoming a member of the Association she has filled several chapter positions. She served as President of the Southern California Chapter from 1949 to 1951 and as Secretary Treasurer of the Louisiana Chapter from 1952 to 1954. She was elected a Director of the Association in 1954.

Essentials of an Acceptable School of Physical Therapy

The House of Delegates of the American Medical Association at its meeting November 29 - December 2 approved the revision submitted by the Council on Medical Education and Hospitals.

This is the first major revision since the adoption of the Essentials in 1934. Three years of study was required by special committees and the national office staff of the American Physical Therapy Association, directors of the approved schools, staff and members of the Council on Medical Education and Hospitals and the Council on Physical Medicine and Rehabilitation to effect the revision. At no time was complete agreement reached, but it is believed that the

revision will provide an effective guide for maintenance and future development of physical therapy education.

The revised Essentials will appear in a later issue of the *Review* after their publication in the *Journal* of the *American Medical Association*.

Happy New Year!

In acknowledgment of the many thoughtful Christmas greetings sent to the National Office, the entire staff joins in a sincere wish to all members and subscribers for their welfare during 1956.

Board of Directors' Meetings

Report of the Secretary

INTRODUCTION

The following report is presented to you in a departure from the traditional manner in order to provide some definitions and explanations which will help in understanding your professional organization, the work of your National Office staff and the deliberations of your Board of Directors.

THE FIVE "W's"

What? This is a written summary designed to be readable and pertinent as a simple method of transferring information.

Whom? To the members from the Secretary.

Why? Regular reports are prepared for you to share in the plans and accomplishments of the Association and to stimulate an exchange of ideas on our goals. All of the affairs of the Association are interwoven within our professional lives. We, as members of the Association receive tangible and intangible benefits; we give our support, loyalty, cooperation, effort, time and money.

Who attends Board of Directors meetings?

The nine elected officers and directors who are all voting members of the Board; the Executive Director, Associate Executive Director and the Consultants of the National Office; from time to time the Advisory Council and Chairmen of Committees.

What transpires?

At its meetings the Board works from an agenda prepared by the Executive Director in consultation with a committee of Board members. The agenda includes items submitted by Board members, chapters, individual members and the staff of the National Office. These meetings bring information to the Board on the work of the headquarters staff and of our contacts with allied organizations, agencies, and individuals. Much of this is informational material but some items require formal Board approval. All items presented are discussed, meditated upon and resolved when possible by consensus of opinion. When definite decisions cannot be reached at one meeting the subjects are referred to special appointed committees or to individual experts, then reexamined at the following meeting. A necessary amount of routine business is presented at each meeting as well as throughout the years by means of bulletins to the Board and reply votes by mail. This includes correction and approval of minutes of the previous meeting, approval of Chapter Bylaw amendments and acceptance of Committee reports.

Why have meetings?

The problems of our Association and its responsibilities to the profession have grown in proportion to the number of members—from the original 245 in 1921 to approximately 6,700 in 1955. Over a twenty year period until 1941, we grew slowly then doubled our size in the next four years. The past ten years have found us rapidly growing at about a triple ratio. We cannot predict our future growth, but we are aware that our Association is changing in its composition, objectives, and scope within an expanding structure. Rather than remaining quiescent and accepting things as they come, our Association tries to plan wisely for the future as well as to meet current problems. It is not always easy to make decisions and arrive at solutions to problems affecting a majority of our members nor can the results always be satisfactory to each one. Meetings, therefore,

provide a mechanism whereby our Board of Directors, representative of the whole membership, is able to come together and through conscious endeavor attempt to evolve solutions for the betterment of the profession and its members.

When and Where? The Board of Directors met in St. Louis during the Annual Conference in June for two full days and several afternoons and evenings. The semiannual meeting was held in New York, October 19-22 on a working schedule of 9 to 5 daily.

Following is a brief review of the items presented to the Board for its information, discussion and approval as indicated. Additional details and progress votes will be found in the *Review* or communicated to the chapters by memoranda from the National Office.

ACTIVITIES OF THE NATIONAL OFFICE STAFF

Of extreme interest to the Board are the reports by each of the consultants in the National Office. From listening to these reports the Board is familiarized with all recent activities of each phase of the Association and is therefore better qualified to discuss and make decisions affecting American Physical Therapy Association members.

The Executive Director, Mildred Elson, reports throughout the meetings on administrative details which require Board action as well as providing résumés of pertinent correspondence and conferences with allied agencies and individuals as the official representative of our Association. In addition to her many other duties, Miss Elson is coordinating the details of planning for the Second Congress of the World Confederation for Physical Therapy which we will entertain. Much groundwork must be accomplished before the meeting and there will be continuing duties long after adjournment. Miss Elson who is also President of the World Confederation for Physical Therapy reported to the Board on all plans for the Congress which include the scientific program, social events, hotel arrangements and exhibits.

The Association has applied for and received an exchange visitor program number from the State Department in Washington which permits us to arrange trainee programs for foreign trained physical therapists who will be coming to this country to attend the Congress.

Each member country of the Confederation names honorary members of the Congress and the members of our Advisory Council will represent us in this group. In addition all speakers on the program become Honorary members.

The Board unanimously elected our President, Mary Nesbitt, to be our official delegate. Great interest in the Congress has been shown among physical therapists abroad and it is hoped that as many as 300 from the various countries will be attending.

Financial support from our own membership is of paramount importance to the success of the Congress and although expenses are being curtailed to a minimum a meeting of this scope must have sufficient funds to adequately provide a scientific and social program of quality.

Chapter Activities

This branch of our National Office is concerned with implementation of service to members and chapters. As Associate Executive Director, Mary Haskell keeps in close touch with their interests and problems. A new Chapter Organizational Manual has been prepared for the use of chapter officers and has been distributed to all chapter presidents and district chairmen. Every member will find this manual to be of great informational interest.

Questions affecting chapters and members are reviewed by Miss Haskell before Board action is taken.

One item of importance regarding a group of rejected applicants for membership was thoroughly discussed by the Board and referred to the Advisory Committees on Professional Education and Chapter Activities for further study and recommendations.

With the appointment of Dorothy Voss to this department, the Board anticipates an expansion and augmentation of membership services.

Professional Education

Professional Education and Recruitment come within the framework of this department which is concerned with a variety of projects. Elizabeth MacAuley, Recruitment Consultant, reported an accelerated program whereby more individuals and agencies are being contacted and new material is being produced for their use. Helen Hickey is preparing a Manual for Vocational Counselors. Dorothy Hewitt is coordinator of the department and has been working jointly with the Advisory Committee on Professional Education and the Council on Medical Education and Hospitals of the American Medical Association on a revision of the Minimum Essentials of a School of Physical Therapy. The Board approved the final draft to be presented to the

House of Delegates of the American Medical Association at their December meeting. Their action will be reported in the *Physical Therapy Review*.

It was with the deepest regret that the Board accepted the resignation of Miss Hewitt, effective July 1, 1956. Sarah Rogers has been appointed as her successor and will begin her duties on May 1st.

Professional Services

The Board discussed and approved two new major projects of this department as presented by Lucy Blair and Ruth Whittemore. Following exploratory planning recommended by the Advisory Committee to Professional Services, a survey of personnel policies for physical therapists throughout the United States will be conducted. This is in recognition of the need for current accurate information and to make this information available to employers in response to requests.

A survey card will be sent to each active and inactive member in the near future with the hope that every one will complete the requested information and return his card.

Plans for a revision of the manual, "Essentials of a Hospital Physical Therapy Department," which was published in 1949 have been initiated by the newly created liaison committee of the American Hospital Association and the American Physical Therapy Association. Three representatives from each organization comprise this committee.

Advisory Council

The six appointed members of this Council furnish advice by personal consultation or correspondence throughout the year. Dr. Aura Severinghaus and Lt. Raoul Psaki met with the Board during one day of the semiannual meeting and gave thoughtful advice on affairs concerning the profession as well as assistance in considering future development. Other members of the Council were unable to attend because of previous commitments.

Sections of the Association

The Board reviewed the structure of sections within the Association and authorized a two day meeting of a special committee to study procedural changes and the composition of the School Section.

A tentative agenda for the 1956 School Section meeting was approved. The Board also approved the tentative agenda for the 1956 meeting of the Self-Employed Section newly created by the House of Delegates in St. Louis. Initial discussions were held in regard to a proposal to establish a section for members interested in research in physical therapy and action was deferred until the next meeting.

Appointments

Advisory Committee on Chapter Activities

Katharine Chilcote of Colorado was appointed to fill the unexpired term of Virginia Vickers who resigned.

Nominations Committee

Anthony DeRosa of New York was appointed to replace Dorothy Voss who resigned because of her appointment to the National Office staff.

Advisory Committee to Professional Education

Agnes Snyder of Washington, D. C. and Dorothy Billenstein of Colorado were appointed to replace Elizabeth Addoms and Mary Elizabeth Kolb whose terms expire January 1. The directors of the schools of physical therapy will select a member to replace Lorraine Lake whose term also will expire. The following members of the Committee will continue to serve until January 1, 1958: Lucille Daniels, Helen Kaiser and Margaret Kohli. This Committee was requested to select its own chairman.

Board of the American Registry of Physical Therapists

Elizabeth Wood and Margaret Moore were reappointed for two year terms as representatives of the Association.

State Licensure and Registration

The Board went on record as strongly urging members to comply with state physical therapy licensing or registration laws and recommended increased emphasis at all levels to publicize the importance of this. Board members approved the principle of making this a requirement for membership in chapter bylaws of states where licensure and/or registration is mandatory.

Finance

The report and recommendations of the Finance Committee were approved including a revised budget.

CONCLUSION

It is hoped that this summary has been readable and has provided you with information that is of professional interest. You, as members, will continue to supply the **Why,** the all important "**W**," since an organization is only as strong as is the demand of the members, and exists only because of its membership. The persons **Who** work for and with you on the Board and on Committees will change with subsequent elections. The **What** will be their future communications, which it is hoped will answer the questions "What do we give and what do we receive from the American Physical Therapy Association?" **When** and **Where** are of small importance as whenever and wherever the Board meets the primary concern will be to nourish the growth of the American Physical Therapy Association to its fullest maturity and its "place in the sun," so that the members wherever they may be will reap all benefits that should evolve from joint participation in a professional organization such as ours.

DOROTHY GRAVES
Secretary

Harold D. Storms, M.D.

Harold D. Storms, M.D., Director of the School of Physical and Occupational Therapy of the State Insurance Fund of Puerto Rico passed away in Puerto Rico on November 25, 1955. He was well known to physical therapists and had been a contributor to the *Physical Therapy Review*. Dr. Storms was a former medical director of the Toronto Clinic of the Workmen's Compensation Board of Canada.

Institute on the Correlation of Physiology with Therapeutic Exercise

The second institute for physical therapy instructors co-sponsored by the U. S. Office of Vocational Rehabilitation and the American Physical Therapy Association will be held April 16 through 20, 1956 at the Extension Study Center, University of Oklahoma, Norman, Oklahoma.

The following were appointed to serve as the Institute Planning Committee: Mary E. Kolb, Chairman, Helen Kaiser and Margaret Kohli. The Committee has had one planning session to formulate the program and select the faculty and is now working on visual aids, exhibits, evaluation forms, etc. Included on the faculty are two physiologists and five physical therapists.

The primary purpose of the Institute is to improve the quality of teaching and to encourage better correlation of basic sciences and technical instruction in our schools. Admission will be limited to physical therapists who are instructors of physiology and of therapeutic exercise in the thirty-five approved schools, as well as in the two schools currently awaiting approval from the Council on Medical Education and Hospitals of the American Medical Association.

Course content will include lectures and demonstrations on basic muscle and nerve physiology; exercises for power, coordination and endurance; influence of activity on cardiovascular and respiratory physiology; selectivity of stimuli; factors contributing to diminution of flexibility and methods for improving range of motion; and methods of teaching. Problem solving clinics will be held daily.

The OVR grant and matching funds from the Association will pay for the program so that tuition will not be charged. Travelships for actual cost of travel will be available for students needing assistance. All students must finance their own living accommodations. Facilities are available at the Extension Study Center at minimum costs.

For application form and information on room reservations and travelships write to:

Miss Helen K. Hickey, Educational Consultant
American Physical Therapy Association
1790 Broadway
New York 19, New York

Short Term Postgraduate Course

Name of Course: Training Program in the Care of the Preschool Cerebral Palsied Child

Dates of Course: February 1 - June 30, 1956

For further information and application write to:

Luigi Luzzatti, M.D.
Director of Training Program
Children's Hospital
3700 California Street
San Francisco 18, California

Student Section

Regional Student Editors

Region I—Editor Audrey Haugaard—Simmons College
University of Connecticut
Boston University
Bouve-Boston School
Simmons College
University of Pennsylvania
The D. T. Watson School

Region II—Editor Joan Erback—New York University
Columbia University
Albany Hospital (Russell Sage College)
New York University
University of Buffalo
Frank E. Bunts Educational Institute
Walter Reed Army Hospital (May-Sept.)

Region III—Editor Rae M. Litaker—Duke University
Medical College of Virginia
Charity Hospital of Louisiana
Duke University
Baylor University
Hermann Hospital
University of Texas
Medical Field Service School (Sept.-May)
Brooke Army Hospital (May-Sept.)

Region IV—Editor Carol Vacca
Northwestern University
State University of Iowa
University of Kansas
Washington University
St. Louis University
University of Oklahoma

Region V—Chairman Beverly Kindig—Mayo Clinic
University of Minnesota
Mayo Clinic
University of Michigan
University of Colorado
University of Wisconsin
San Juan, P. R.

Region VI—Editor Lorna Call—Childrens Hospital
Childrens Hospital
University of Southern California
University of California
College of Medical Evangelists
Stanford University
Letterman Army Hospital (May-Sept.)

Student Editor—Beverly A. Kindig

Report from Boston University Sargent College

With a mighty bang of *Grey's Anatomy*, we are off to a flying start this year. The semester is almost a third over, and it is the considered opinion of the class of 1957 that books are being made bigger and better than ever.

Anatomy, orthopedics, pathology, electrotherapy and several other courses are keeping us more than busy, and social life is being confined mainly to the week ends now. The seniors are settling into the routine of morning affiliations at many of the Boston hospitals. This year we are fortunate to have two new affiliations, one at Beth Israel Hospital, the other at Children's Medical Center. Our total enrollment of junior, senior and 12-month students has reached an all time high of 98, including 10 men. In this number are Lily Wee, a 12-month student from the Philippines, who also has taken occupational therapy training in this country, and Consuelo Zea from Columbia, South America.

The freshmen and sophomore prospective physical therapy majors have found and are experiencing several curriculum changes with the addition of some humanity courses and fewer physical education courses, although the emphasis here at Sargent is still on physical education during our first two years.

Miss Adelaide McGarrett, the director of the physical therapy department, spent an interesting and enjoyable ten weeks this summer in Europe on a tour sponsored by the National Foundation for Infantile Paralysis. In Edinburgh she visited the Physiotherapy School at the Royal Infirmary, and later toured the Scottish Highlands. She spent twelve days in London where she visited the St. Thomas Hospital School, the London Hospital School, and other places of professional interest along with the tourist attractions of the world's largest city. From there Miss McGarrett went on to Oslo, Stockholm, Helsinki, Copenhagen, Amsterdam, Vienna, Rome, Milan, Zurich, Geneva, and Paris. She says that in many of these cities new hospitals have been built, several of them having 1,000 beds or more. The hospital in Vienna has 4,000 beds.

The Sargent Physical Therapy Club is busy organizing itself this year. Officers have been elected and plans are being made that will stimulate the interest of the students in all the

classes. Included in these plans are the annual banquet, several speakers, cake and food sales, a Christmas party for handicapped children, a hospital tour, orientation films for freshmen and sophomores, and two editions of the club newsletter *The Current*.

MARY M. AULT
Boston University Sargent College
Class of '57

Graduate Program at University of Pennsylvania

Apparently it is difficult for some college graduates to understand why anyone should want to pursue a full-time graduate program which does not lead to an advanced degree.

There are forty of us enrolled here in the Physical Therapy Program at the University of Pennsylvania School of Auxiliary Medical Services, with an additional number due in February. Perhaps there are those who also wonder what a heterogeneous group of this size has in common—to compel them to return to the academic grind for an additional year of intensified study where practically everything, except school must be excluded for twelve months.

Specialization is part of the answer. Physical therapy is a highly technical and specialized profession and, as is characteristic of most professions, a broad period of training is one of its earmarks and requirements. This requirement is necessarily imposed upon each of us in order to become a qualified integral member of the therapeutic team. Furthermore, this requirement can not be satisfied by "on the job training," but only by graduation from an accredited program.

Although the undergraduate background of our class is diversified, including as it does degrees in such fields as physical education, health education, biology, chemistry, and English literature, we do have in common a solid foundation in the science of "sciences" and the science of "people."

Besides this academic preparation which is enough to arouse anyone's curiosity in his fellow human beings, we have all had a chance to do a little settling and maturing, and to be very sure that physical therapy is our final vocational objective. Most of us have also had one or more years of work experience before continuing our education; and thus we have all had a chance to become familiar with working with other people, their codes of ethics, and their tools. This experience we have gained as teachers, coaches, social service workers, etc., is now being shared among our classmates.

Many of our classmates are aided by scholarships or the G. I. Bill, but others have had to scrimp and save to return to school. Many are supporting wives and families at the same time. Certainly we would not attempt this endeavor without seriousness of intent.

We have time to study, to think, to study, to plan and to study. Being confident of our aim—obtaining a certificate of proficiency, passing the registry examinations, and giving service to society—we feel fortunate that in only twelve months we can realize a goal that many of us have desired for years. Most of all, we feel a close bond and a warm respect for our fellow classmates who have trekked here from nine states and two countries to pursue this worthy purpose.

We at the University of Pennsylvania extend warm greetings and sincere encouragement to all physical therapy personnel and especially to our fellow physical therapy students.

LOUISE HARDY
University of Pennsylvania
Class of '56

Where to Go? What to Do?

Many high school juniors and seniors have these questions on their minds. For every girl and boy the choice of a college and a career is one which requires much long and serious thought.

For many years Bouvé has had one day a year when prospective students were invited to a "Come and See" program. At this time demonstrations of both physical therapy and physical education were given. An opportunity for questions and a social gathering with students and faculty followed. How much did these potential students learn? How many of their questions were answered?

As a student, it is my guess that some of the most important aspects of life at Bouvé may have been overlooked. Consequently, we are delighted with the new plan that is to be tried out this year: any prospective student may visit the school at her convenience during the year. On the day she chooses, she will be assigned a student hostess with whom she will spend the day attending classes, going to lunch, and visiting the dormitories. This intimate view of college should give her a clear picture of what it means to attend this professional school.

After admission in the freshman year a student has an opportunity to choose between physical therapy and physical education. To give her a clearer outlook concerning these two professions, each department has been assigned three periods in the orientation course for demonstrations and discussion.

For the physical therapy department the first meeting consists of a lecture by the head of the department at Bouvé. It is planned to answer basic questions relating to physical therapy in general, and is followed by a showing of the APTA filmstrip, "A Career of Science and Service," with commentary. In the second period, physical therapy procedures are demonstrated by upperclassmen with commentary by members of the physical therapy faculty. You may ask why it is not presented entirely by the faculty. We feel that it brings the whole subject closer to the freshmen when they see that other students have actually learned to carry out these treatments. The final hour is set aside for the showing of the APTA film, "Within Your Hands," and for a question and answer period.

We hope that this new plan will lend itself to helping freshmen choose their vocation, and we as upperclassmen are looking forward to our part in this orientation.

BARBARA GORMAN
Bouvé-Boston, 1957

Report from Simmons

The Origin and General Plan of Our Program

The origin of the Simmons program in physical therapy is especially interesting in that the program did not originate at Simmons at all, but rather at Harvard Medical School. In the early 1920's, Harvard Medical School began to offer to college graduates a nine-months' course in physical therapy, but in the World War II years, Harvard Medical School was forced to abandon the courses that did not lead to the M.D. or the Ph.D degree. Therefore in the fall of 1946, Dr. William T. Green of Harvard Medical School contacted President Bancroft Beatley of Simmons, and the School of Science at Simmons immediately showed definite interest in adopting a physical therapy program. The late Miss Janet B. Merrill, Technical Director of the Program in Physical Therapy until 1951; Dr. John A. Timm, Chairman of the School of Science; and Dr. Arthur L. Watkins and Dr. William T. Green, Co-Directors of the Program, worked out the transfer, and in September of 1947 the program in physical therapy was first offered at Simmons. However, the revised course had become a sixteen-months' course, offered to college graduates, leading to a diploma in physical therapy or a four and one-half year program leading to the B.S. degree and a diploma in physical therapy.

In the general plan of the four and one-half year program, the courses of the first three years are taught at Simmons College itself, while the courses taken during the last year and a half, with the exception of applied physiology, are given at affiliated hospitals. During the first three years the value of a general education is stressed with the emphasis on science. In these years the course allows for eight electives and requires studies such as English, chemistry, general biology, anatomy, physiology, and microbiology, medical physics, psychology, education, and physical education. The last year and a half, continuing through the summer except for one month's vacation, consists of professional training given at Children's Hospital, the Massachusetts General Hospital, the Peter Bent Brigham Hospital, and the Bay State Rehabilitation Clinic. Dr. W. T. Green and Dr. A. L. Watkins are the Medical Directors and Miss Shirley Cogland is the Technical Director.

Our Common Meeting Ground—The Simmons Physical Therapy Club

Since prospective physical therapists in the freshman, sophomore, and junior classes are at Simmons College itself, and the seniors and fifth year physical therapists are at the affiliated hospital, we need a common meeting ground and our Physical Therapy Club is the answer.

The Club meets one evening a month in Alumnae Hall on the Simmons campus. The meetings usually consist of three parts: a short business meeting; a program focused on physical therapy with a speaker, a special demonstration, or a film; and a social hour—refreshments, games, and getting acquainted. Our officers for this year are President, Dorothy Bruce (January '57); Vice President, Janet Peterson (January '58); and Secretary-Treasurer, Elinor Johnson (January '57). With the help of our advisors, Miss Shirley Cogland and Miss Margaret Rowe of the Physical Education Department, all the Simmons physical therapists are brought into an active, working unit. We're all looking forward to another interesting and fun-filled year!

We're Proud

During the past summer, as you all know, the Boston hospitals were desperately understaffed to meet the conditions created by the polio epidemic. Our fifth year physical therapists answered the call and gave up a portion of their well-deserved vacation to volunteer their help. You can see why we're proud of them. Our hats are off to Nancy Cameron, Pat Flynn Church, Anne Kirkpatrick, Jewel Austin, Beverly Chaffee, Sonia Parker, Maureen Davidson, and Polly Hatheway Howard—all scheduled to graduate in January 1956.

AUDREY HAUGAARD
Simmons College,
Class of '58

New Student Members

Charity Hospital

Wilson Fulton
Warren Hauth
Karen Kalin
Walter H. Schmidt

Grady Vaughn School

Delores Allen
Bob Dean
Peggy Driscoll
Joan Dyer
Joe Eubank
Lawrence E. Klein
Charles D. Mandeville
Louis Mullins
Peggy Nowin
June Scarborough
Maurice Sivertson
Gene Snipes
William Steffens
Mary Strickland
Leland Wicks

Mayo Clinic

Russell Addison
Russell E. Beran
Marvin Bobb
Alice Conrad
Sally Dodge
Loucilla Ellis
Gilbert J. Guscott
Pheobia Heard
Betty Hines
Mary A. McIntyre
Jean S. Muscle
Ruth Nickerson
Marian L. Nowak
Ann Pruitt
Eunamae Pullie
Lois Rathbun
Corrine Rhyne
Beverly Sellberg
Jerry L. Smith
Mary A. Sullivan
Helen Truesdale
Patricia Ulrich
Sushilkumar Verma
Geraldine Yuhas

U. S. Army Medical Service

Judith Burdick
Nerlene Chandler
Anne Cochran
Martha Craig
Barbara A. Davis
Mary Lu Dwyer
Eileen Harmer
Mary A. Hinckley
Rosemary Lehrer
Helyn McGown
Loyal McNair
Josephine Morelli
Elizabeth Plumpe
Janice Riches
Velma Schlorff
Joan Smith
Nancy Taft
Lorrine Thompson

University of Buffalo

Stanley A. Elman
Herbert Goldberg
Renee Gregory
Patricia A. Hoehing
Frank J. Kager
Colleen A. Peckham
Christine T. Pronobis
Lloyd Resnicoff

University of Colorado

Frances K. Anderson
Suzanne Beresford
Jo Anne Boehm
Burton Dunevitz
Norma Gilbert
Carol Harmon
Ann Marshall
Barbara Meine
Arlene Mowder
Robert Pfeiffenberger
Dennis Plooster
Barbara Roueche
Yvette Senninger
Carole Soe
Kathleen Spell
Patricia Strutzel
Pauline Thellin
Carol Walde
Marjorie MacWilliams

University of Iowa

William Beattie
William Dohse
Phil Harlan Edie
Jacquelyn Geis
Katherine Jacobson
Mary McGinty
William Philipp
Gyles Russell
Robert Shea
Thomas Stephenson
Robert C. Walker
Rita Jo Walsh
Marlene M. Williams
Fred Zamberletti

University of Southern California

Robert Antonick
Joseph Chasin
Sara Clark
Sarah A. Davis
Joseph Feloney
Carl C. Forrest
William Garton
Essie Gee
Victor Lunderman
Katherine Martin
Joan McCollom
Donna Miller
Donald Nikchevich
Vern Pascal
Louis Paul
Mary Ryan
Betty F. Schmidt
Shula Slaughter
L. Eugene Snedigar
Larry Standifer
June Sugiyama

Short Term Courses

Poliomyelitis Care

Announcement has been received of a course open to physicians, nurses, medical social service workers, physical and occupational therapists and covering complete care of poliomyelitis with emphasis on the severely involved patient, the physician's responsibility in the effective coordination of auxiliary services, and the value of comprehensive care.

Name of Course

Demonstration of Clinical Management of Poliomyelitis

Sponsor of Course

Baylor University College of Medicine, Southwestern Poliomyelitis Respiratory Center and Jefferson Davis Hospital in cooperation with

the National Foundation for Infantile Paralysis, Inc.

Dates of Course

February 27, 28, 29 and March 1 and 2, 1956

Course Content

Lecture discussions will include diagnostic methods, treatment of acutely ill patients, indications and use of respiratory equipment, physical and occupational therapy programming and functional goals of the rehabilitation program.

Case conference demonstrations covering total medical care and philosophy of treatment will be held. There will be demonstrations of various types of respiratory equipment with opportunity for supervised practice in their use and application. Small discussion groups will meet according to specialty area, i.e. medical care, physical therapy, occupational therapy, nursing and social work, to discuss technics and relationships to total program.

Fee

Tuition — $8.50 which will cover cost of syllabus, "Treatment of Acute Poliomyelitis"

Financial Assistance

Physicians and nurses requesting financial assistance may apply to their local chapter of the National Foundation for Infantile Paralysis, Inc. All medical social workers, physical and occupational therapists, and any physicians and nurses whose professional responsibilities cover more than the local area should direct inquiries to the Division of Professional Education, The National Foundation for Infantile Paralysis, Inc., 120 Broadway, New York 5, N. Y.

Note: Applicants for financial assistance must submit completed applications to the National Foundation office at least six weeks prior to date course begins.

Living Accommodations

Accommodations must be arranged by the individual

General Information

Preference will be given to personnel who are or will be directly concerned with poliomyelitis patient management. A selected number of nurses, physical and occupational therapists may arrange to stay two weeks or one month for additional theory and practice in the area of their specialization.

Additional information and application forms may be obtained from:

William A. Spencer, M.D., Medical Director
Southwestern Poliomyelitis Respiratory Center
Jefferson Davis Hospital, 1801 Buffalo Drive
Houston 3, Texas

New York University-Bellevue Medical Center

Name of Course

Advanced Course in Physical Rehabilitation Methods

Sponsor of Course

New York University-Bellevue Medical Center, The Institute of Physical Medicine and Rehabilitation in conjunction with New York University School of Education

Admission Requirements

1. Graduation from an A.M.A. approved physical therapy course and one year of clinical experience
2. Foreign-trained persons are screened by director with advice and approval of the APTA

Dates of Course

February 6–March 2, 1956
May 14–June 8, 1956

Course Content

The course is divided into three sections: 1. Severe Disabilities and Their Rehabilitation; 2. Skills and Methods of Functional Activities; 3. Clinical Experience

Academic Credit

4 credit hours on either undergraduate or graduate level

Fees:

Tuition—$100.00 ($25.00 per point); Registration—$7.00
Qualified veterans may enroll in the course under the provision of P.L. 346 or P.L. 16

For further information, application, and list of scholarship sources please write to:

Mrs. Edith Buckwald Lawton
Director, Rehabilitation Courses for Physical Therapists
Institute of Physical Medicine and Rehabilitation
400 East 34th Street
New York 16, N. Y.

University of Southern California

Name of Course

Neurophysiology in the Treatment of Neuromuscular dysfunction

Dates of Course

July 9-27, 1956

Admission Requirements

Graduation from an A.M.A. approved physical therapy educational program

Course Content

Lectures and laboratory practice in the understanding and use of the reflex mechanisms and sensory stimuli in the facilitation of a physiologic response

Academic Credit

3 semester hours of graduate credit

Fees

Tuition — $60.00
Board and Room — estimated $25.00 per week

For further information, application and list of sources write:

Physical Therapy Department
University of Southern California
University Avenue
Los Angeles 7, California

National Society Changes Publication Name

The *Bulletin on Current Literature*, published since 1940 by the Library of the National Society for Crippled Children and Adults, has changed its title to *Rehabilitation Literature*, beginning with the January 1956 issue.

The new name will identify better the subject coverage of the monthly bibliographic bulletin, which will continue to index and abstract not only medical and therapy literature but also the current periodical articles, pamphlets and books in the other professional areas of special education, psychology, social welfare, and employment as relating to the rehabilitation of handicapped children and adults. As an Easter Seal Society service, *Rehabilitation Literature* will continue to be published monthly, and its subscription rate will remain at one dollar a year.

The Old Farmer's Almanac

The *Review* office is grateful to *The Old Farmer's Almanac* for brightening our year with a complimentary copy of the 1956 edition which is its 164th continuous publication. We anticipate keeping up with historical dates, the tides and phases of the moon and pondering their philosophy, jokes, and recipes.

Their verse for January is a noteworthy one for the new year

"The first of things! However die our valiant year
Find courage to begin the journey set
In such a season?

The year has learned, out-countenancing fear,
And plodding on, it somehow learned to bet
On men, beyond all reason,

Who somehow win,
However they begin."

North Carolina Examination for Physical Therapists

The North Carolina State Examining Committee of Physical Therapists announces that its spring examination for registration in North Carolina will be held on Friday, April 6, 1956 in Chapel Hill, North Carolina.

Any physical therapist interested in practicing physical therapy or in applying for registration in the state of North Carolina should contact the secretary of the Examining Committee at least six weeks prior to examination time. Please address all correspondence to Margaret L. Moore, Secretary-Treasurer, State Examining Committee of Physical Therapists, c/o North Carolina Memorial Hospital, Chapel Hill, North Carolina.

Cinefluorography

Through the combined efforts of the University of Rochester Medical Center and the General Electric Company, X-ray Department, Cinefluorography (x-ray motion pictures) is now available as a clinical and research aid. The new apparatus is designed for use with conventional x-ray equipment and the subject may be photographed in sitting, standing, or supine positions.

The University of Rochester group has made over 1,500 clinical x-ray motion pictures. Among those of interest to physical therapists are studies of the human skeleton for the Encyclopedia Brittanica film division and the mechanism of speech, produced in collaboration with Columbia University, Department of Linguistic Research.

Physical Therapy Programs—1956

APPROVED BY THE COUNCIL ON MEDICAL EDUCATION AND HOSPITALS OF THE AMERICAN MEDICAL ASSOCIATION

Schools offering the four year program leading to a baccalaureate degree will accept high school graduates, *as well as transfer students.* Schools offering the 12 to 16 months program leading to a certificate will accept students who have completed all or most of their undergraduate work providing they meet certain course requirements. Recipients of a degree or certificate have equal professional recognition and status. For specific information regarding each school's entrance requirements, tuition, and other fees, please write to the director indicated below. All students should investigate course requirements *early.*

	Degree	*Certificate*
CALIFORNIA		
Mrs. Mary J. Dodge School of Physical Therapy Childrens Hospital Society 4614 Sunset Boulevard Los Angeles 27		†
Mr. R. William Berdan School of Physical Therapy College of Medical Evangelists 312 N. Boyle Avenue Los Angeles 33	†	†
Mrs. Margery L. Wagner Curriculum in Physical Therapy University of California The Medical Center San Francisco 22	†	†
Miss Charlotte W. Anderson Department of Physical Therapy University of Southern California University Park Los Angeles 7	†	†
Miss Lucille Daniels Division of Physical Therapy Stanford University Stanford	†	†
COLORADO		
Miss Dorothy Hoag Curriculum in Physical Therapy University of Colorado Medical School Denver 20	†	†
CONNECTICUT		
Miss Frances Tappan School of Physical Therapy U 101 University of Connecticut Storrs	†	
ILLINOIS		
Miss Elizabeth C. Wood Course in Physical Therapy Northwestern University Medical School 303 East Chicago Avenue Chicago 11	†	†
IOWA		
Mrs. Olive C. Farr School of Physical Therapy State University of Iowa University Hospitals Iowa City		†
KANSAS		
Mrs. Ruth G. Monteith Section of Physical Therapy University of Kansas Medical Center Kansas City 3	†	†
LOUISIANA		
Miss Marjorie F. Martin School of Physical Therapy Charity Hospital of Louisiana 1532 Tulane Avenue New Orleans 12		†
MASSACHUSETTS		
Miss Shirley M. Cogland *School of Physical Therapy Simmons College-Children's Hospital 300 Longwood Avenue Boston 15	†	†
Miss Adelaide L. McGarrett Curriculum in Physical Therapy Sargent College, Boston University 6 Everett Street Cambridge 38	†	†
Miss Constance K. Greene Curriculum in Physical Therapy *Bouve-Boston School, Tufts College Medford 55	†	
MICHIGAN		
Miss Virginia Wilson Curriculum in Physical Therapy University of Michigan University Hospital Ann Arbor	†	†
MINNESOTA		
Mrs. Ruby M. Overmann Course in Physical Therapy University of Minnesota 860 Mayo Memorial Hospital Minneapolis 14	†	
Mr. Darrell D. Hunt School of Physical Therapy Mayo Clinic Rochester		†

* Accepts women students only

	Degree	Certificate
MISSOURI		
Sr. M. Imelda, S.S.M. Course in Physical Therapy St. Louis University 1325 South Grand Boulevard St. Louis 4	†	
Miss Beatrice F. Schulz Department of Physical Therapy University of Washington, School of Medicine St. Louis 10	†	
NEW YORK		
Miss Dorothy L. McLaughlin *School of Physical Therapy Albany Hospital-Russell Sage College New Scotland Avenue Albany 1	†	†
Miss Mary E. Callahan Courses for Physical Therapists Columbia University College of Physicians & Surgeons 630 West 168th Street New York 32	†	†
Miss Elizabeth C. Addoms Physical Therapy Curriculum School of Education, New York University Washington Square East New York 3	†	†
Miss Mildred F. Heap Program in Physical Therapy University of Buffalo 2183 Main Street Buffalo 14	†	†
NORTH CAROLINA		
Miss Helen Kaiser Division of Physical Therapy Box 3403, Duke Hospital Durham		†
OHIO		
Miss Dorothy Spark Course in Physical Therapy Frank E. Bunts Educational Institute 2020 East 93rd Street Cleveland 6		†
OKLAHOMA		
Miss Thelma Pedersen School of Physical Therapy University of Oklahoma, Medical Center Oklahoma City 4	†	†
PENNSYLVANIA		
Miss Kathryn Kelley Curriculum in Physical Therapy D. T. Watson School of Physiatrics Leetsdale		†
Miss Dorothy E. Baethke Division of Physical Therapy University of Pennsylvania 1818 Lombard Street Philadelphia 46	†	†
PUERTO RICO (All classes given in Spanish)		
Mrs. Lutgarda Vega de Cruz School of Physical & Occupational Therapy Professional Bldg., 8th floor Stop 22, Santurce		†
TEXAS		
Miss Doris E. Porter Grady Vaughn School of Physical Therapy Baylor University Hospital Dallas 1		†
Miss Ruby Decker Curriculum for Physical Therapists University of Texas, Medical Branch Galveston	†	†
Mrs. Cecelia J. Lee School of Physical Therapy Hermann Hospital Houston 25		†
VIRGINIA		
Miss Susanne Hirt School of Physical Therapy Medical College of Virginia Richmond 19	†	
WISCONSIN		
Miss Margaret Kohli Course in Physical Therapy University of Wisconsin Madison 6	†	†
U. S. ARMY MEDICAL SERVICE		
*Physical Therapy Course Medical Field Service School Brooke Army Medical Center, Fort Sam Houston, Texas and Brooke, Letterman and Walter Reed Army Hospitals Write to: The Surgeon General Department of the Army Washington 25, D. C. Att.: Personnel Division		†

*Accepts women students only.

Please direct all inquiries regarding tuition, entrance requirements and other specific information to the school and *not* to the American Physical Therapy Association.

Abstracts

Effect of Physical Methods on the Mechanics of Breathing in Poliomyelitis.

Gustav J. Beck, George C. Graham and Alvan L. Barach, ANN.INT.MED., 43: 549-566, September 1955

The purpose of the paper is to report the alterations in the breathing pattern and ability to eliminate secretions as enhanced by physical methods. Patients with chronic pulmonary insufficiency due to respiratory muscle paralysis secondary to poliomyelitis were studied. The difficulty in breathing and coughing varied from moderate to marked.

Pulmonary ventilation measurements were obtained in 10 patients by means of a Bennet Ventilometer during the inhalation of air and 100 per cent oxygen. While under study, one of three methods was used to ascertain its effect on pulmonary ventilation. The methods were: (1) application of a double-spring type pad belt to the lower abdomen; (2) application of a sandbag to the lower abdomen; and (3) assistance of expiration by manual compression of the lower ribs. With these mechanical methods an increased efficiency of ventilation, decrease in dyspnea, and less use of accessory muscles of respiration were obtained in 7 of the 10 patients. The use of the belt and sandbag over the abdomen were the more effective means of raising the diaphragm into the chest. A more effective ventilation of the lungs was evidenced by a decreased minute volume of ventilation and increased tidal air.

To facilitate the elimination of secretions retained in the bronchial tree, exsufflation with Negative Pressure was studied. Gradual inflation of the lungs was produced by a blower unit with a peak positive pressure of 40 mm. Hg. at the end of a 2 to 2½ second inspiratory cycle. This was followed quickly (.02 second) with a pressure drop to 40 mm. Hg. below the atmosphere. The negative pressure was maintained from 1 to 2 seconds.

The results were favorable in 13 of 16 patients under study. Each of these patients had an insufficient coughing mechanism to eliminate bronchial secretions. Failure to assist patients was due to lack of cooperation in 2 cases and to severe cerebral anoxia in 1. There were individual differences in the technic used concerning choice of mask or mouthpiece, and position of body and head. Various procedures should be attempted to determine the most adequate for each patient. Patients with a tracheotomy may also be treated with this method.

Selective Distribution of Blood Through the Terminal Vascular Bed of Mesenteric Structures and Skeletal Muscle

B. W. Zweifach and D. B. Metz, ANGIOLOGY, 6:282-288, August 1955

The structural characteristics of the smallest blood vessels have been minutely described but no particular emphasis has been placed on the arrangement of the various vascular units as discrete organic units around which the functional behavior of the vascular bed is organized. This study has resulted in broad generalizations concerning these functional characteristics.

In general, the capillary bed proper was found to be made up not of a series of uniform vascular structures, but of an admixture of muscular and nonmuscular vessels of capillary dimensions. The muscular components occupied a central position, in many instances directly through to the venous side. In addition to structural considerations, a number of unique functional characteristics contribute to the regulation of blood flow, among these: (1) the centrally placed muscular units achieve the finer regulation of blood flow; (2) there is an extremely high degree of reactivity on the part of these muscular units to chemical influences, chiefly of local tissue origin; (3) a phenomenon of vasomotion represents the modulating influence between systemic and local regulating forces. These several facets of vascular behavior have been found to be incorporated into the homeostasis of particular vascular beds.

The structural make-up of the terminal vascular bed in skeletal muscle was observed in the spino-trapezius muscle of the rat adjacent to the midline attachment to the spinous processes of the vertebrae.

The larger blood vessels are distributed along the connective tissue cleavage planes of the muscle in which they anastomose freely with comparable elements to form a series of arterial and venous arcades. The capillary bed proper arises from metarterioles which terminate abruptly as a series of capillaries or as preferential channels. The latter type of thoroughfare vessel is most common along the edges of the muscle. During periods of reduced blood flow, the circulation persists through the arteriolar and venular vessels in the cleavage planes, while the interior of the muscle is ischemic. An intermittent capillary circulation comparable to that in other tissues is readily apparent.

Respiratory Alkalosis with Especial Reference to Chest Pain.

Bernard P. Wolff, DIS. CHEST, 28: 337-342, September 1955.

Respiratory alkalosis is usually referred to as the hyperventilation syndrome. It may be defined as a state of altered physiochemical processes due to the excessive loss of carbon dioxide through overbreathing. This syndrome is being recognized more frequently as indicated by numerous reports appearing in the literature. In this paper the author discusses the various symptoms and treatment of respiratory alkalosis rather than the biochemical and clinical changes incident to overbreathing. References for the latter are given.

It is explained that many of the patients have only two or three features of the syndrome at the time of examination but nearly all will have experienced the complete syndrome at some time in the past. Two almost constant complaints in chronic respiratory alkalosis are a sense of exhaustion and ease of fatigue. Two points distinguish their exhaustion and fatigue from that of organic disease: (1) the exhaustion is greatest in the morning and tends to improve progressively during the afternoon and evening; (2) the ease of fatigue always improves after a period of moderate exercise. This improvement is due to the increased production and repletion of carbon dioxide following exercise.

Other symptoms may be a disturbed sense of balance, chest pain, and decreased motility of the diaphragm.

In the treatment of this syndrome, paper bag rebreathing has been stressed as a reassurance of the patient by reproduction of symptoms and psychotherapy. Parenteral calcium gluconate often gives dramatic relief for several days. Calcium salts are probably effective through their ability to produce both smooth and

striated muscle relaxation thereby reducing the spastic elements which are so prominent in the production of symptoms. Mild sedation is of help, but the author states that perhaps the most effective item in treatment is the institution of regular outdoor exercise in the form of long walks. It is explained that exercise releases tension, replenishes the carbon dioxide, and strengthens the diaphragm.

Experiences with Ultrasonics

Ronald Robins-Browne, SOUTH AFRICAN J. PHYSIOTHERAPY, 9: 3-5, July 1955

Dr. Robins-Browne wrote this report after personally administering over 3,000 ultrasonic treatments with a machine that propagated vibrations of 800,000 cycles per second of continuous unmodified oscillations using a transducer head of 7 sq. cm.

The effects of ultrasound are (1) mechanical, which includes disintegration of crystalline solids and sometimes of colloid particles; (2) thermal, heat is generated in any medium by ultrasound, the amount depending on the energy absorbed and the nature of the medium; (3) chemical, including oxidation, hydrolysis, and depolymerization; (4) regeneration of the dermis; (5) hyperemia and vasodilation; (6) antispasmodic and muscle relaxant to a minor degree; (7) intophoretic as demonstrated with histamine.

From the series studied the author feels that the technic employed should be direct labile application with a suitable medium. Recommended intensity is between 1 watt/sq. cm. and 3 watts/sq. cm. for periods of about 10 minutes and not to exceed 15 minutes. Daily treatments are advised, with 15 appearing to be the limit of response. Advantages to ultrasonic therapy are that the treatments are of short duration, the patient does not become overheated and no discomfort is produced.

Contraindications to the application of ultrasound include radiation of the eye, brain tissue, growing epiphyses, gravid uterus, tumors, and areas of acute infection.

A few conditions treated favorably were osteoarthritis, amputation stumps with neuromata and causalgia, supraspinatus syndrome, rheumatoid arthritis, and trauma of the soft tissues.

Ultrasonics definitely has a place in physical medicine and treatment should be in the hands of persons qualified and acquainted with physical therapy. The use of ultrasound is in its infancy and with further clinical and laboratory research is destined to be placed on a more sure footing.

Kyphoscoliosis

J. I. P. James, J. BONE & JOINT SURG., 37-B: 414-426, August 1955.

The term kyphoscoliosis has been used frequently but loosely to describe an effect due to rib rotation without determining whether a kyphosis was in fact present. The purpose of this paper is to describe a number of cases where there is a true vertebral kyphosis. Twenty-one deformities of congenital origin, 10 idiopathic, and 2 secondary to neurofibromatosis are discussed. The diagnosis is established and was usually first suspected by radiography. In true kyphoscoliosis the area of kyphosis is very short and in no way comparable with an epiphysitis. Scoliosis shows a smooth curve; when this becomes angular or squared, and if there is one clear disc space, kyphoscoliosis should be suspected.

In cases where a congenital skeletal abnormality was the etiological factor, the kyphoscoliosis occurred at two levels, thoracolumbar and cervicothoracic. Paraplegia occurred at both levels. Prognosis points toward a likelihood of a severe and progressive deformity. Treatment, in view of the difficulty of correction of these deformities, should be early spine fusion. In 4 of the 5 cases of paraplegia reported, the paralysis was found to be due to a congenital skeletal anomaly producing pressure on the cord; the paraplegia developed in the later years of growth. In the fifth case, the history was not clear.

Lateral radiographs of a number of patients with scoliosis revealed 10 cases of severe idiopathic kyphoscoliosis. The usual site was the midthoracic region. The kyphosis was seen only in the more severe examples of idiopathic infantile thoracic scoliosis. The prognosis for the group is poor but paraplegia was not found. Treatment is similar to that advocated for congenital kyphoscoliosis, correction by distraction and fusion.

One high thoracic and one thoracolumbar kyphoscoliosis were seen in two girls with neurofibromatosis. In both the deformity was severe. The characteristic pigmented skin patches were present also.

The Effectiveness of Chlorpromazine (Thorazine) with Cerebral Palsied Children.

Eric Denhoff and Raymond H. Holden, J. PEDIAT., 47: 328-332, September 1955.

Chlorpromazine, a central nervous system depressant, was evaluated for its physical and behavioral effects on 18 cerebral palsied children. In the evaluation four criteria were studied: (1) beneficial effect on the child's over-all behavior, (2) relaxant effect on musculature, (3) palatability and ease of administration, and (4) low toxicity.

The 18 subjects in the study varied in ages from 1 to 12 years of age. There was a wide range of physical handicap. The children were classified in one of three behavioral categories. Four of the children had "body anxiety," that is, extreme fear of falling or fear of heights. Four were classified as "anxious" due to emotional or environmental causes, and the remaining 10 were classified as "nonanxious." Each child was his own control, with half of the children receiving the drug for a two week period and the other half receiving a disguised placebo. In the next two week period, the two groups were reversed.

Therapists made tests on the children before taking the drug and during the period of administration of the drug and placebo. Experimental tests consisted of (1) plank walking 3 feet above floor level, (2) quickly pulling a blanket from under the child, (3) playing "pin the tail on the donkey" while blindfolded, and (4) hanging on gymnasium rings. The children were also evaluated for physical and emotional behavior by the therapists and school teacher.

The therapists' rating scales indicated that 50 per cent of the children showed improved behavorial adjustment to the experimental situation, while receiving chlorpromazine. All four of the children rated as having "body anxiety" showed improvement under the drug. Four of the 10 patients called "nonanxious" were more relaxed behaviorally. A positive prediction of which children were on the drug was significant. Parents of 8 children reported improvement. There was no difficulty in administering the drug, and no

bad side effects except that a slight listlessness was reported. Two children showed remarkable improvement. One boy attempted to walk for the first time and another girl sat alone for the first time. There were no significant relaxant effects on the musculature.

The Clinical Epidemiology of Poliomyelitis.

Dorothy M. Horstmann, ANN. INT. MED., 43:526-533, September 1955.

This discussion is concerned with the family epidemiology of poliomyelitis. Evidence indicates that the disease is among the most contagious of infections, and in a family it spreads with speed and thoroughness to involve practically all susceptible members.

The epidemiology of several families and epidemics were cited. In one family of 8 children, all the children had clinical cases of the disease. Four had paralysis of which 1 child died and 4 were ill but had no residual paralysis. The spread of the disease in this family indicated that the family was easily affected as a unit and not individually, and there was no significant interval between the sickness of its members. The group appeared to be infected either simultaneously or the disease has a very short incubation period.

While all members of an exposed family probably do not have clinical cases of poliomyelitis, they are usually infected. In 2 studies cited, 91 per cent of familial associates of known clinical cases were either excreting virus or possessed specific polio antibodies.

The determination of complement fixing antibodies has added another means of defining the spread of infection through families. Two nursery-school-borne outbreaks in New York City were studied. In both epidemics the children in the school introduced the virus into their families and infected their parents as well as their siblings. Laboratory studies of the members of the family evidenced either Type I virus or Type I neutralizing antibodies. This outbreak as well as others in the United States, also emphasized that in the past 20 years there has been a marked shift in the age distribution of the disease. There is a steady decrease in the percentage of clinical cases occurring in young children, and a continually increasing percentage in young adults. It appears that this disease, like other virus infections such as hepatitis and measles, is apt to cause a more severe infection in a susceptible and exposed adult than in a child. Reasons why one person is more seriously affected than others is not fully understood. The strain of virus and virus dosage are, in part, an explanation.

Lateral Instability of the Ankle in Paralytic Cases.

R. L. Anderson, H. M. Hills and A. A. Abplanalp, SOUTH. M. J., 48: 718-723, July 1955

This study was made of 32 cases of poliomyelitis from a standpoint of the functional and anatomical stability of the ankle joint itself following various types of arthrodesis of the foot.

A patient having an equinus deformity with concurrent lateral deformity, and in addition a flail foot, was most likely to have instability of the ankle joint both clinically and upon x-ray examination. By lateral deformity, the authors mean that the foot was held in a valgus or a varus position due either to muscle imbalance or to a habitual position. The patient with a lateral deformity alone was next most likely to have lateral instability. Patients with equinus and a flail or dangle foot were least likely to have lateral instability.

In cases with a calcaneus deformity, no definite conclusions were reached.

Disregarding the question of equinus or calcaneus deformity, in 13 cases with lateral deformity, about one-half had lateral instability clinically and more than one-half showed evidences of instability on roentgen examination.

In extremities with lateral deformity and flail foot, a high percentage had lateral instability clinically as well as upon x-ray examination. In patients with flail feet alone, one-half had lateral instability clinically and a somewhat lesser number showed it on x-ray.

The Effect of Repeated Muscular Exertion on Muscle Strength.

H. D. Darcus and Nancy Salter, J. PHYSIOL., 129: 325-336, August 1955

Studies described here are on the effects of repeated maximum isotonic and isometric contractions on the strength of pronation and supination of the hand and flexion of the elbow. Each daily training session consisted of 30 contractions at intervals of one minute. This was carried out by one group of subjects for five or six days. Another group of subjects continued training until 20 to 28 training sessions had been completed.

Both types of training resulted in an increase of the strength measured both isotonically or isometrically, although the effects of "static" training were not immediately apparent.

"Static" training, although carried out in only one position of the joint, resulted in an increase in all other positions tested. An improvement in muscle strength was also found in the antagonists of the same side and the corresponding groups on the other side.

"Static" training in flexion caused an increase in the strength of supination and vice versa.

The authors present quite a complete discussion, comparing this method of training with other clinically accepted exercise procedures.

Abnormal Response to Muscle Relaxants

H. C. Churchill-Davidson, PROC. ROY. SOC. MED., 48: 621-624, August 1955.

Although this condensed paper deals primarily with the causes of an abnormal response to muscle relaxants and with some suggestions to aid in the diagnosis of this condition, it contains some interesting information on normal neuromuscular transmission.

The chemical theory of normal neuromuscular transmission is now widely accepted. The basic concept is that on the arrival of an impulse at the end of a motor nerve, acetylcholine is responsible for bridging the gap between nerve and muscle fiber. These molecules excite the end-plate receptor on the fiber and trigger off a wave of depolarization which spreads along the fiber and brings about a mechanical contraction.

Two methods of studying neuromuscular block in man are discussed: (a) volitional activity and (b) electromyographic studies. The muscle strength study requires the maximum possible effort on the part of the subject while conscious, which is sometimes difficult to obtain. In electromyography, the main nerve to a muscle, or group of mus-

cles, is stimulated a variable number of times per second, and the resultant contraction of the muscle fibers is recorded either electrically or mechanically. This method can be used on either conscious or anesthetized patients, but the results obtained are not strictly comparable with those of volitional activity.

The author then describes four types of neuromuscular block, relating myasthenia gravis to two of these. He then concludes with a discussion of the abnormal response of persistent apnea in clinical anesthesia, its possible causes and some suggestions to aid in the diagnosis based on the previously given background.

Etiology of Cerebral Palsy: An Experimental Approach.

Eric Denhoff and Raymond H. Holden, AM. J. OBST. & GYNEC., 70:274-281, August 1955

A study of possible causative factors in cerebral palsy was made with 15 children who had "suspicious" findings of brain damage at birth and neonatally, and 17 healthy controls selected at random from 504 consecutive ward births. The groups were followed for two and one-half years after birth and evaluated with a series of accepted physical, neurological, and psychological examinations.

Only four (27 per cent) of the "suspicious" group had abnormalities in physical, psychological, and/or social development when intensively studied at the end of the two and one-half year period. Three (18 per cent) of the control group had similar findings.

The one common finding in the abnormal cases of both the "suspicious" and the control groups was a previous abortion in the mother's history. This is striking since abortion is also found to a high degree (28 per cent) in mothers of children already known to have cerebral palsy. Mothers of cerebral palsied children experience a 35 per cent higher rate of infant loss than the general population and it must be assumed to be because of some constitutional factor or endocrine dysfunction.

It is concluded that one important area of research in the etiology of cerebral palsy involves further investigation of reproductive physiology.

The Natural History and Prognosis of Infantile Idiopathic Scoliosis

J. C. Scott and T. H. Morgan, J. BONE & JOINT SURG., 37-B: 400-413, August 1955

The material for this study was obtained from 1,200 patients with scoliosis seen between 1922 and 1952 at the Wingfield-Morris Orthopedic Hospital in Oxford, England. The natural history and prognosis of infantile idiopathic scoliosis were reviewed and 28 cases are reported in this paper. All cases chosen had scoliotic curves present at the age of 2 years.

There was no sex differentiation present in these cases as compared with a prevalence in girls of scoliosis which started after the age of 2 years. The curve pattern was almost exclusively thoracic (after the age of 2 years, only one-third of significant curves are thoracic). The apex of the curve was to the left in 93 per cent of the patients whereas in thoracic scoliosis occurring after the age of 2, the apex is to the right in 85 per cent of the cases. These facts tend to confirm that infantile idiopathic scoliosis is distant from scoliosis starting after the age of 2 years.

Composite graphs representing progression of the curves of the 28 patients were prepared. They seemed to indicate that a patient with an initial curve of 30 degrees would progress by about 5 degrees per year. But an analysis of individual cases revealed that deterioration started at different ages and remained stationery for varying periods of time. The rate of progression once it started remained fairly constant. Fourteen patients followed to maturity had curves averaging 120 degrees; those who had not yet reached maturity all had severe deformities.

The length of the curve, the degree of rotation, the age of onset of deterioration, and the rate of progression are the most important factors in determining the type and severity of the deformity. The greatest functional disability in this type of scoliosis arises from the thoracic deformity. The vital capacity is reduced and cardiovascular function is impaired by the distortion and diminution of the thorax. Often the whole body may be underdeveloped, presumably because of a generalized failure of growth. Cosmetic disability is usually severe and depends on decompensation and rib distortion.

Resolving infantile idiopathic scoliosis is described and seven cases are reported. In this group the deformity becomes less apparent as the infant gets older.

The differential diagnosis of scoliosis is discussed and infantile idiopathic scoliosis is briefly compared with congenital scoliosis.

Providing Prostheses after Amputation for Malignancy

William F. Hickey and A. Arthur Rosse, J. REHABILITATION, 21: 9-10, July-August 1955

A patient with an amputation of an extremity is not always a suitable candidate for a prosthesis. Those who have amputations because of malignancy may not be considered as good risks. A vocational rehabilitation agency might question if it were economically sound and the physician if it were medically advisable. The question arises as to whether a period of time should or should not be allowed to elapse before ordering the prosthesis to see if the malignancy is under control.

The authors collected the records of 55 patients from the files of 17 vocational rehabilitation agencies. They were male patients for the most part between the ages of 10 and 55 years and according to the records, all had amputations secondary to cancer.

Of the 55 patients, 51 or 92.7 per cent lived for two years or more after their prosthesis was obtained. During this time they were gainfully employed in various jobs. Twelve per cent of the original group of 55 cases lived for 11 years or longer. Some of the patients had waited six months or more after amputation before being fitted with a prosthesis. Of these, 53.1 per cent were still alive at the time of this study. Of the group that underwent a waiting period of six months or less, 69.5 per cent were surviving at the time of the study. Therefore, the wearing of apparatus did not seem to have an adverse effect on prognosis. The amputees were gainfully employed after obtaining their prostheses. It was projected that for a period of 10 years for every dollar spent in surgery, treatment, and equipment, over four dollars was returned in taxes from the employed amputees.

Providing prostheses for these patients was, therefore, considered economically feasible, medically sound, and a good psychological stimulus.

Contributions of the Doctor of Physical Medicine as a Hospital Diagnostician.

Leslie Blau, J.A.M.A., 159: 554-556, October 8, 1955.

Pioneering doctors in the field of physical medicine are aware that treatment with physical medicine and the diagnosis and management of disease must be in expert hands for proper utilization and development. Their efforts led to the establishment of the American Board of Physical Medicine and Rehabilitation and the designation of physicians in this clinical speciality as physiatrists in 1946. Requirements in this field cover a broad realm of medicine, surgery, and allied fields such as biophysics, since the physiatrist may be called upon to deal with a large variety of cases.

In a general medical and surgical hospital, the physiatrist may have the functions of administration, diagnosis, therapy, and research. It is his job to coordinate the services of ancillary departments for the total adjustment of the patient prior to discharge. Although any physiatrist may vary the emphasis in these specific functions, he should not neglect clinical functions of diagnosis and therapy. Close and direct supervision of a skillful physiatrist is necessary to keep therapists' treatments from deteriorating to a routine "heat, massage, and exercise." It is up to the physiatrist to make changes in modalities and treatment regimen according to the physical and mental condition of the patient, and with his understanding of the fine effects and minute differences of physical agents.

The importance of accurate diagnosis of patients referred for physical medicine treatment should not be minimized. The physiatrist may aid the referring physician by utilizing his clinical acumen and modern electrodiagnostic equipment for an accurate diagnosis. Several cases are cited in which unfortunate results would have occurred if the physical medicine treatment had been followed without intervention and reconsideration of diagnosis by a physiatrist. Practices of lengthy physical therapy may sometimes be counteracted by periodic reevaluations by the physiatrist.

Medical literature points out that physicians trained in physical medicine must have more detailed knowledge of such diseases as arthritis, cerebral palsy, peripheral vascular diseases and poliomyelitis. Therefore, they are in a position to be of assistance to general practitioners and others in diagnosing diseases and treating patients.

Cerebral Palsy: A Practical Routine for Discerning Oculomotor Defects in Cerebral Palsied Children.

George P. Guibor, J. PEDIATRICS, 47: 333-339, September 1955

Oculomotor defects exist in over 50 per cent of patients with cerebral palsy resulting from central nervous system derangement. These ocular motor defects should be detected before degeneration of vision occurs in these children. Early treatment of these motor defects will develop vision and may improve general motor ability, especially in patients with athetosis or ataxia.

Simple tests are suggested by the author for detecting the presence of strabismus by the corneal reflection test, congugate defects by the motility test, and subnormal vision by means of the "E" game. An "E" chart of 10 feet distance testing instead of 20 feet distance is presented in this paper. This "E" chart gives percentages of visual efficiency as well as ordinary visual notations.

Other tests such as the near vision and fixation tests were purposefully omitted from the paper.

Clinical Investigation of Cerebral Palsy.

H. Hirashima and Y. Kinoshita, SHIKOKU ACTA MEDICA, 7: 8-12, July 1955

Statistical and clinical observations were made of 250 cerebral palsied youngsters in a Japanese clinic between 1950 and 1954 with the following results.

The number of cerebral palsy cases born in the summer months and winter months were slightly larger than the number born in the spring and autumn months. No differences were found between males and females.

The incidence of cases in families of farmers occurred more frequently than in families of merchants or public servants and was also higher among rural than urban dwellers.

It was found that cerebral palsy occurred in the first born less frequently than in succeeding siblings and a significant difference between the first born and sixth born was recognized.

Of the cerebral palsy patients 24.8 per cent were premature infants weighing less than 2.5 Kg. at birth and the smaller birth weight resulted in a higher incidence of cerebral palsy.

Generally, the children affected with cerebral palsy showed disturbances of growth and delayed dentition.

Shortening of the Femoral Neck Following Fracture

Daniel W. Pratt, VIRGINIA M. MONTHLY, 82: 404-406, September 1955

It is an established fact that there is resorption of bone at the fracture line following such an injury. Several factors cause this resorption such as movement at the fracture line, infection, and comminution with loss of bone substance. The resorption of bone causes shortening of the overall length of the bone. It is especially important to consider this factor of shortening when using an internal splint for fixation of fractures of the neck of the femur. If the degree of shortening is significant, there is the possibility of the nail rupturing into the acetabulum.

To evaluate the various methods of internal fixation of femoral neck fractures, a group of 32 cases was selected. The investigation was directed towards determining the amount of shortening, when the shortening began, and the ultimate fate of the fixation device. At various intervals the length of the femoral neck, as seen on x ray, was measured.

Of the 32 cases, measurable shortening of the femoral neck was found by x-ray examination in 24 of the patients. The shortening occurred early, within 8 weeks after reduction of the fracture and varied from one-fourth to one-half inches. The poor end results were much more frequent in those hips where the greatest shortening occurred.

In those cases where the distal end of the nail was not anchored, the nail backed out commensurately with the shortening. There was no loss of fixation, since the nail retained its relative position in the neck and head of the femur. No device of the Smith-Peterson type nor Venable Screw penetrated into the acetabulum.

Low Backache in Industry.

Ralph N. Wilson and S. Wilson, BRIT. M. J., No. 4940, 649-652, September 10, 1955.

The object of this paper is to show what can be done by a doctor and a physical therapist to alleviate suffering and reduce the period of incapacity which result from low back pain. In a five-year period, 1,163 cases were seen and treated. Of these, 664 (57.1 per cent) were traumatic in origin and 499 (42.9 per cent) were considered as having a nontraumatic etiology.

Causes for the traumatic cases seemed to be mostly work or lifting which required flexion and rotation of the spine, sudden reflex movements and unaccustomed work involving periods of prolonged bending. Causes for the nontraumatic cases were often speculative.

Thick-set stocky men, often with a flat lumbar curve comprised 85 per cent of the cases seen. Slim men of average height seldom complained of nontraumatic backache.

Treatment for this series of patients consisted of infra-red therapy, massage, and in most cases manipulation, with occasional use of strapping and short-wave diathermy. The authors felt this regime to be successful. So long as the exact cause of the backache was unknown, it was felt that empirical treatment was justified. Prompt treatment of even trivial cases of backache by relaxation and manipulation reduced suffering and absenteeism.

The confidence and cooperation of the patient was in most cases essential for success of the therapy. Weather conditions undoubtedly affected symptoms. Cold, wet weather increased not only the pain in the chronic cases, but also increased the actual number of traumatic cases reporting for treatment.

The Clinical Application of Electromyography to Lower Motor Neuron and Muscular Disorders.

Karl O. Von Hagen, BULL. LOS ANGELES NEUROL. SOC., 20: 131-138, September 1955.

Since electromyography was first developed it has been used extensively in the study of muscle physiology but has not attained widespread use as a clinical tool. This paper consists of a series of illustrative cases which point out the clinical value of electromyography.

The modality may be used to facilitate a positive diagnosis of progressive spinal muscular atrophy and its differentiation from progressive muscular dystrophy. It is also helpful in the differentiation of hysterical reactions from atypical manifestations of peripheral nerve disorders. It may be used to find the correct localization of peripheral nerve and nerve root lesions and in determining their prognosis. It is, therefore, a valuable adjunct to the neurologist's armamentarium in the evaluation of lower motor neuron diseases and conditions which simulate them.

It is probable that electromyography has its greatest application in the management of peripheral nerve lesions since it gives information regarding the location, completeness of the lesion and progress of degeneration or regeneration. Marinacci in 1954 reported on its application in the differential diagnosis of the triads of muscular affection—disuse, neurogenic and myogenic atrophy.

The electromyogram should be made by a competent physician and its findings correlated with the clinical history, the neurological examination, and appropriate laboratory and special procedures.

Electrophoretic Studies on the Plasma Proteins in Orthopedic Diseases. Part I. Electrophoretic Analysis of the Plasma Proteins of Patients with Rheumatoid Arthritis.

Hideo Fukuta, SHIKOKU ACTA MEDICA, 6: 1-14, June 1955

Electrophoretic analysis of plasma proteins of patients with rheumatoid arthritis was performed in order to clarify its clinical significance and the relationship between the changes of plasma protein and the process of the diseased joints and adjacent structures by means of Tiselius' apparatus.

The author also examined the plasma proteins of patients with ankylosing spondylitis and osteoarthritis which are closely related to rheumatoid arthritis, and studied the correlation of these diseases.

Following the Steinbrocker classification, rheumatoid progression was classified into four stages. In the first and second stages an increase of alpha globulin was detected, whereas in the third and fourth stages, a remarkable increase of gamma globulin and depression of albumin-globulin ratio was noted. This clearly showed the progress and prognosis and rheumatoid arthritis to be first a change of alpha globulin and secondly albumin-globulin ratio derangement.

Following administration of cortisone, there was a decrease of gamma globulin and fibrinogen which corresponded to a clinical improvement.

Erythrocyte sedimentation rates had positive correlation, highly significant to the total protein, total globulin, gamma globulin, and fibrinogen, whereas a negative correlation, highly significant to the albumin content and albumin-globulin ratio also appeared.

In patients with ankylosing spondylitis, the plasma protein revealed patterns very similar to those of rheumatoid arthritis and showed almost the same changes as that of the latter after administration of cortisone. The plasma proteins of osteoarthritic cases showed a decreased albumin-globulin ratio and an increase of alpha globulin and fibrinogen.

Diagnosis and Prognosis in Aphasia.

Hildred Schuell, ARCH. NEUROL. & PSYCHIAT., 74: 308-315, September 1955.

The symptoms of aphasia are so complex and diverse that little agreement can be found in the literature regarding diagnosis, prognosis, or treatment. The author describes a procedure used for these purposes.

In this study, test results for 56 patients are analyzed, findings of diagnostic and prognostic significance are discussed, and general principles of treatment are indicated. First, it is necessary to consider aphasia in relation to three cerebral systems essential to language processes: the auditory, visual, and sensorimotor systems. Secondly, it is necessary to think of aphasia in relation to the four language modalities in which impairment may be observed: understanding of what is said, talking, reading, and writing.

Findings from these tests are analyzed and fall into definite patterns. These patterns remain constant and each carries a specific prognosis. These patterns are (1) a pattern of severe impairment, for which prognosis is poor; (2) a pat-

tern of impairment based on disturbance of auditory retention and recall, for which prognosis is excellent, and this same pattern complicated by coexisting, (3) visual involvement, (4) sensorimotor involvement, or (5) generalized brain damage with mental deterioration. The significant findings for each pattern are discussed in terms of differential diagnosis, prognosis, and the basis of treatment.

Cerebrovascular Accidents: A Study of Two Hundred One Cases.

Maynard M. Cohen, ARCH. PATH., 60: 296-307, September 1955

At Ullevaal Hospital, Oslo, Norway, a series of 610 postmortem examinations were conducted and of these 25.7 per cent exhibited pathologic lesions characteristic of a cerebrovascular accident. The following conclusions were reached from this study.

Infarction was the commonest parenchymal lesion resulting from disease of the cerebral vessels. These lesions were usually not fatal and were most frequent in the cerebral gray matter.

Cerebral infarction was clinically unrecognized in nearly 40 per cent of cases showing nonfatal lesions. In contrast, fatal cerebrovascular accidents were almost uniformly clinically evident. On rare occasion they were obscured by other diseases.

Hypertension and myocardial hypertrophy were extremely frequent concomitants of cerebral infarction or hemorrhage.

Patients exhibiting cerebral hemorrhage tended to die at an earlier age and exhibited more severe hypertension than did those with infarction.

Encephalomalacia in the absence of demonstrable vascular occlusion was considered to result from a combination of factors reducing the blood supply and increasing the oxygen demand. Factors reducing the blood supply included vascular sclerosis, cardiac impairment, and the limited ability of hypertensive persons to maintain cerebral blood flow in the face of transient drops in the peripheral blood pressure. Variations in oxygen requirements temporarily increase demand and appeared responsible for the predominance of infarctive lesions in cerebral gray matter.

Hemorrhagic infarcts could not be clinically differentiated from anemic infarcts. Anticoagulants were generally contraindicated because of danger of converting a hemorrhagic infarct into a frank hemorrhage.

Intracranial aneurysms were most commonly located on the middle cerebral artery or in the region of the anterior communicating artery. The danger of aphasia or of compromising the anterior cerebral circulation contraindicated direct surgical approach in many of these cases.

In rare instances, clinical evidence of cerebrovascular accident may appear unaccompanied by a demonstrable morphologic change.

Acute myocardial infarction accompanied recent cerebrovascular accidents in approximately 15 per cent of the cases.

Effect of Changes in Limb Posture on Peripheral Blood Flow.

Peter Beaconsfield and Jean Ginsburg, CIRCULATION RESEARCH, 3: 478-482, September 1955.

Change in body posture is known to have profound effects on cardiovascular hemodynamics. Thus, when the upright position is assumed the pulse rate rises, the blood pressure falls slightly, the velocity of venous flow decreases in the lower limbs and the cardiac output falls. When the position of an extremity alone is altered, and the body remains in a constant position, the resultant changes in limb blood flow have been a subject for controversy. This paper records the results of measurements in the change of flow in the hand, foot, forearm, and calf when the position of an extremity alone was altered; the body remained horizontal throughout the experiment.

The blood flow through these regions was measured with the limb elevated to 15 and 45 degrees and 45 degrees dependent, using venous occlusion plethysmography in normal and sympathectomized subjects.

The use of venous occlusion plethysmography was investigated in the dependent position, and reasons given for assuming the validity of the method under the conditions of the experiment.

The blood flow in the normal limb, after at least 3 minutes in a dependent position or elevated position of 45 degrees, is less than the flow measured in the horizontal position. At 15 degrees of elevation, the flow was greater than when horizontal.

Similar decreases in flow in the dependent and elevated positions of 45 degrees were found in sympathectomized limbs. At 15 degrees of elevation, recently sympathectomized limbs did not always show increases in flow.

The Release of an Inhibitory Substance from Mammalian Brain, and Its Effect on Peripheral Synaptic Transmission.

E. Florey and H. McLennan, J. PHYSIOL., 129: 384-392, August 1955

In 1954 Florey showed that the brain and spinal cord of mammals contained an extractable substance which in crustaceans exerted a peripheral inhibitory effect. The present paper reports on the effects of this substance on mammalian synapses. It was tested for its effect on transmission in sympathetic ganglia of cats and rabbits, and on neuromuscular transmission in cats.

Transmission block could be established with low concentrations of the inhibitor in the inferior mesenteric ganglion and the stellate ganglion. No effect could be obtained in the superior cervical ganglion. The substance depends upon the pH in the 'in vitro' experiments but evidence points to the fact that it may be active at all pH levels in the intact spinal cord.

Neuromuscular transmission in the gastrocnemius and tibialis anterior muscles was unaffected. This was not surprising since there has been no indication from any reports of an inhibitory nerve supply to striated muscle and extracts from the sciatic nerve contained no detectable amounts of an inhibitory factor.

It could be demonstrated that the inhibitory factor is produced by the living brain. No inhibitory activity could be detected in extracts of liver, spleen, heart, muscle, sympathetic ganglia; or sciatic nerve.

Cerebral Palsy: Where Next?

Russell V. Fuldner, ARCH. NEUROL. and PSYCHIAT., 74:267-279, September 1955.

The divergent views on the etiology of cerebral palsy are briefly discussed. The author makes the statement that treating cerebral palsy will never do; the goal must be prevention. He makes a plea for further

studies of infants with complicated deliveries in order to obtain a clearer understanding of the mechanisms of neonatal asphyxia, and to provide follow-up procedures for accurate diagnosis. In a research program of this scope and direction lie some of the most promising leads for the prevention of cerebral palsy.

These statements are based on the findings of the study described. From 667 children examined by the author, 204 cases were selected. They were selected to obtain patients representative of the chief motor syndromes of infantile cerebral palsy in nonepileptic, mentally responsive children. The selected cases fall into four diagnostic groups: athetoid quadriplegia, spastic quadriplegia, spastic hemiplegia, and spastic paraplegia. The hospital birth records, or their equivalent, were examined and tabulated. Factors known to be associated with genetic defect were traced by means of familial and gestational histories and by records of congenital deformities in the patients and their siblings.

The results of the entire study give little support to a concept of cerebral palsy based on heredofamilial defect. The cause of cerebral palsy in many of these cases was quite evidently fetel oxygen deprivation. It is also suggested that since data supplied by many hospital records are inadequate, the incidence of fetal anoxia is probably higher than this study suggests.

Lumbar Traction Therapy—Elimination of Physical Factors that Prevent Lumbar Stretch.

Bernard D. Judovich, J.A.M.A., 159: 549-550, October 8, 1955.

Traction is widely used in the conservative treatment of low back and/or sciatic pain. Usually weights are applied to either a pelvic belt, or the lower extremities, with an average of about 10-15 pounds on each side. It has been found that the surface traction resistance of the lower segments of the body completely neutralize this force, so that none of it is effective for stretch of the lumbar spine. Therefore, this method is of no value as a longitudinal stretch force to the lumbar spine.

When applying weight to the lower extremities, the higher the segment in which the stretch force is desired, the more weight is necessary. As much as 10 pounds will effect some stretch on the knee joint, but none superiorly, whereas 15 pounds will provide stretch at the hip joint, but none at the lumbar spine. All applied weight which does not exceed the surface traction resistance of segments below the lumbar spine is without lumbar stretch effect.

The forces necessary to overcome surface traction resistance have been found to be equal to 54 per cent of the weight. In the case of the lumbar spine, since the lower segment of the body is almost half the body weight, 26 per cent of the entire body weight is the force necessary to overcome the resistance of the lower body segment.

The author describes a means of eliminating the lower body segment resistance by constructing a bed in two sections.

Present methods of constant weight traction therapy to the lumbar spine are inadequate since insufficient pull is applied to overcome the surface traction resistance of the lower body segment. The author does not attempt to evaluate the effect of traction therapy on the lumbar spine.

The Treatment of Behavior Disorders in Children with Tolserol.

A. M. Freedman, M. W. Kremer, R. C. Robertiello and A. S. Effron, J. PEDIAT., 47: 369-372, September 1955.

Tolserol has been investigated in other studies for its effect on the neuromuscular system as well as behavior of the neuropsychiatric patient. In this study the authors attempted to ascertain its effect on 22 children with psychiatric disorders. Of this number, 8 were diagnosed as schizophrenic, 5 as organic, and 9 as primary behavior disorders. The children ranged from 6 to 12 years of age. They were not hospitalized but were closely observed. The observers were not informed if a patient was receiving Tolserol or some other drug. The patients were observed and graded in seven categories: excessive motor activity, anxiety, relationship problems with children and with adults, affect, pathognomic symptomatology and fantasy life.

After receiving Tolserol, only 6 of the children whose psychiatric disorder was diagnosed as schizophrenia or primary behavior disorder showed improvement. The drug did produce definite improvement in all of the patients with organic behavior disorders. Considering all patients, the most impressive change was observed in their relationship problems with other children and adults. Nine patients demonstrated a decrease in manifest anxiety. Other areas of the children's psychiatric behavior were not significantly affected. Age appeared insignificant in relation to a favorable or unfavorable response. No toxic effects were observed after administration of Tolserol. Many children, however, did complain of its unpleasant taste. For this reason, Tolseram, a related compound of equal therapeutic effect, but more palatable, is being used.

Recent Advances in the Studies and Treatment of Emphysema.

Burgess Gordon, GERIATRICS 10: 397-404, September 1955.

The term emphysema designates the condition characterized by overdistension of the lungs with impairment of pulmonary function and failing circulation.

The author reviews the etiology, pathology, and symptoms of emphysema, and the physiology of respiration.

The physical dynamics of the thorax and abdomen, when modified by disease, faulty posture, careless habits of breathing, and weakness, may provoke or accentuate disturbance of pulmonary function. This is illustrated in the gradual increase in circumference of the chest in emphysema, due in part to the excessive use of thoracic breathing, with corresponding disuse of the abdomen to discourage diaphragmatic breathing. The penalty is failure to move air in and out of the lungs in a normal manner, resulting in the retention of residual air and correspondingly low oxygenation.

The specific steps concern the physiologic rehabilitation of so-called reversible pulmonary disease, as follows (1) removal of abnormal secretions from the air cells and bronchial passages; (2) use of procedures that will encourage effective breathing, both in mechanical and physiological aspects; and (3) preservation of the whole dynamic action of the respiratory system to encourage adequate ventilation and gas exchange.

Breathing exercises are a valuable adjunct in the treatment of emphysema. Diaphragmatic breathing should be stressed. Patients should be taught to prolong and complete the expiratory phase of respiration and to develop effective diaphragmatic control.

Book Reviews . . . . .

Fractures and Joint Injuries, Vol. 2. *By Sir Reginald Watson-Jones, F.R.C.S., F.R.A.C.S., F.A.C.S., M. Ch.Orth., B.Sc., M.B., Ch.B. L.R.C.P.; Orthopedic and Accident Service, London Hospital, Shropshire; Civilian Consultant in Orthopedic Surgery, Royal Air Force; British Editor of Journal of Bone and Joint Surgery. Cloth; price $22.00 for Vol. 1 and Vol. 2. Pp. 445 to 1073; illus. Williams and Wilkins Co., Baltimore, Md. 1955.*

The author is the leading authority of our time on fractures and joint injuries. This is the fourth edition and the previous editions have obtained recognition in all the civilized countries of the world. Sir Reginald Watson-Jones has been distinguished with every possible high academic and professional honor.

The basis of his work is primarily his own vast experience but he does not hesitate to draw from his confreres when it is of material advantage. He has reference to important works that have to do with fracture and joint injuries.

This volume deals with specific injuries and their treatment. Under injuries of the upper limb, changes of the rotator cuff of the shoulder are considered along with fractures and dislocations of the shoulder. Injuries of the elbow include the displacement of epiphyses and elbow fractures in both children and adults, and there is an excellent article on scaphoid fractures at the wrist. There is a description of the modern methods of treatment of the fractured hip in the section on injuries of the lower limb. The conservative treatment described for fractures of the calcaneus fails to include the correction of position and reestablishment of normal gait. Injuries of the trunk included chapters on facio-maxillary injuries, injuries of the chest and pelvis, as well as fractures and dislocation of the spine. Of particular interest to physical therapists and physiatrists is the chapter on principles of rehabilitation following fractures and joint injuries. The last chapter discusses the organization of an accident service.

The author is remarkably successful in clearly and concisely portraying his vast experience of surgery during the war and in civilian life. The book is easily readable. The illustrations are superb; they are not only excellent reproductions, but are extremely well chosen to illustrate his concepts.

He writes with distinct clarity and the illustrations make it easier to understand the material. The scope of the book is complete. This is the outstanding book in English literature on fractures and joint injuries.

Transplantation of Tissues. Cartilage, Bone Fascia, Tendon, Muscle. Vol. 1. *By Lyndon A. Peer, M.D., Clinical and Research Director of the Rehabilitation Center for Plastic and Reconstructive Surgery at St. Barnabas Hospital, Newark, New Jersey. Cloth; price $13.50. Pp. 421; illus. Williams and Wilkins Co., Baltimore, Md., 1955.*

This comprehensive work is a welcome addition to the subject of tissue transplantation. It should do much to clarify this commonly misunderstood and sometimes misused reconstructive procedure. The author is eminently qualified to produce this volume, and demonstrates not only his investigative and practical abilities, but his capacity as an interesting and lucid writer as well. The volume is intended for physician, surgeon, and medical student, as the author indicates, and will be of value to each in developing a sound background to approach the clinical application of tissue transplantation.

The work is divided into six major parts, the first concerned with general considerations of cellular function and reaction, and the last with the theories of cell regeneration. Between, are parts concerned specifically with cartilage, bone, fascia and tendon, and finally muscle. Each of these parts has chapters which deal with the development of the particular structure, its reaction to transplantation in animals, as well as the clinical uses of such transplantations. The chapters are subdivided by section and paragraph heading, and the type is large and clear, permitting easy reading and reference. The line drawings, schematic illustrations, photographs, and photomicrographs are well chosen, excellent in reproduction, and fit the text well. The book is so arranged that it may be taken up at leisure, without seriously disrupting its continuity.

No single portion of the book can be considered as more outstanding or illuminating than other parts, since the manner of presentation makes even the most involved subject matter easily understood. The extensive survey of literature in each of the sections affords a most comprehensive review of all previous considerations and technics in tissue transplantations.

Ideally, one would recommend the book in its entirety to all physical therapists. Those who have the time will find much basic information which will contribute to a greater understanding of the problems involved in the management of patients who have had tissue transplantations. Perhaps the section dealing with fascia and tendon transplantations will be of most interest, since these procedures are those most commonly seen by therapists. Here is amassed not only the work of the author, but also comments of many other authorities in a concise and clear manner, not otherwise available without an exhausting literature review.

Fundamental Concepts in Clinical Psychology. *By G. Wilson Shaffer, Professor of Psychology, Director of the Psychological Clinic, Johns Hopkins University; Chief Psychologist, Sheppard and Enoch Pratt Hospital, Maryland. And Richard S. Lazarus, Assistant Professor of Psychology, Johns Hopkins University; Psychological Consultant. Cloth; price $6.00. Pp. 540; illus. McGraw-Hill Book Co., New York.*

Recognizing the complexity of the field and the need for literature dealing with fundamental concepts of modern clinical practice, the authors have made a systematic and comprehensive presentation of principles and methodology in clinical psychology. Starting with a historical approach, the book reviews theories and underlying clinical technics, and continues with an evaluation of instruments for the measurement of intelligence and personality.

From the viewpoint of the more advanced clinician the most valuable part of the book is the excellent presentation of dynamics underlying various psychotherapeutic methods and the description of modern methods of treatment such as electroshock therapy, psychosurgery, narcosis therapy, etc. The inclusion of case history material showing the close alliance between psychology

and psychiatry is especially pertinent to an understanding of the need for teamwork and treatment of the patient as an individual.

The style of the book is simple, direct, and clear without being abrupt. Printing is in good taste and numerous examples of test materials and illustrations greatly enhance the content. A well selected bibliography is appended. The book is a scholarly work with the unusual quality of a combined research point of view and a sympathetic understanding of clinical problems. It is considered an outstanding contribution to the field of clinical psychology.

Kinesiology. The Anatomic and Mechanical Fundamentals of Humon Motion Illustrated. *By Katharine F. Wells, Ph.D., Associate Professor, Department of Hygiene and Physical Education, Wellesley College; Visiting Lecturer in Physical Education for Women, University of Colorado 1954-1955. Second Edition. Cloth; price $5.50. Pp. 516; illus. W. B. Saunders Company, Philadelphia, Pa. 1955.*

The second edition of *Kinesiology* has retained the basic philosophy and approach to the subject matter as was presented in the first edition. It is considered a complete text covering the material customarily presented in a college course of one year's duration. There is an extensive bibliography following each chapter and, in addition, a list of recommended reading which provides a rich source of information both for the inquiring student and the teacher.

The book was written with the student's interest and the student's problems in mind. The author is a teacher at heart who, through years of experience, has acquired the rare skill of helping students to "see" those things which are invisible to the eye. The motto of the book is: "Effectiveness of instruction is no' determined so much by what the teacher does, as by what he leads the pupil to do." This philosophy is well illustrated by the large number of laboratory exercises and demonstrations which follow each segment of the body.

The book has retained the original four main parts, which have been rearranged, and about half of the book has been rewritten.

Part 1 deals with basic kinesiological concepts, neurological and physiological principles, and the fundamental descriptive anatomy of the musculoskeletal system.

Part 2 deals with the application of the basic principles of mechanics to human motion. This section has been completely rewritten with the goal in mind of presenting it to the beginner in such a form that neither physics nor mathematics need to be considered as a prerequisite.

Part 3 deals with basic principles underlying motor skills. This section has also been rewritten and places its major emphasis on acquainting the student in physical education with the very general, almost common sense, principles of various sport performances.

Part 4 deals with applications of kinesiology to various sports, giving broad anatomical features, mechanical analyses, and suggestions for the teacher, including an analysis of locomotion.

The last three chapters of this section deal with some aspects of corrective physical education, giving samples of conditioning exercises and posture correction exercises, and with a brief description of the major technics utilized in physical and occupational therapy.

From the point of view of a physical therapist one cannot help but regret that the author felt compelled to lead the student to believe that an elementary introduction to the basic principles of motion and muscle function is adequate preparation for the analyses of the highly complex sport activities, and of postural defects. This is probably the main reason why texts written primarily for the student in physical education remain of rather limited appeal to those teaching kinesiology to physical or occupational therapy students. One may question the need for spending a good portion of the text on basic descriptive anatomy instead of gradually developing the discussion of muscle function to a higher level of complexity.

The author introduces the concept of living anatomy through her abundant examples of laboratory exercises which may well serve as a stimlulating reference to any teacher of that subject.

At times the author introduces pathological aspects of muscle function, such as spasticity and exaggerated stretch reflexes, but their discussion seems unrelated to the text as a whole as well as to their clinical implications. The less complex concept of flaccid paralysis or muscle weakness with its unlimited and interesting kinesiological implications is not introduced.

The beginning student in physical therapy is likely to welcome the chapters on the mechanics of human motion but will find the remainder of the book of limited usefulness. The teacher in physical therapy will find some stimulating ideas both in approach to teaching and organization of subject matter.

Cultural Difference and Medical Care. *By Lyle Saunders, Associate Professor of Preventive Medicine and Public Health (Sociology), University of Colorado, School of Medicine under the sponsorship of the Russell Sage Foundation. Cloth; price $4.50. Pp., 317. Russell Sage Foundation, New York, 1954.*

The author has developed in a very interesting manner the twofold purpose of the book as stated in the introduction. One is to present information about Spanish-speaking people of the American Southwest that may be useful to medical and related professional people who work with this group, and the other to illustrate that the same understanding of medicine and culture, and the interrelations between them applies to all groups in the practice of medicine.

The first three chapters are devoted to the background of the Spanish-speaking people and includes their economic states, their cultural background and subcultural differences, the degree of acculturation, and the cultural chasm which exists between people of Spanish descent and the Anglos among whom they live. It is pointed out that the cultural differences are great, and the chasm present because of the lack of mutual understanding and the tendency to consider as wrong those attitudes and customs which differ from ours. Generalizations by many Anglos of the characteristics of Spanish-speaking people without knowledge of the "why" of the behavior, the language differences, differences in orientation to time, differences in the attitude toward change, work, efficiency, acceptance and resignation, the inability to participate in formal organizations, and the strength of the family ties all contribute to the lack of understanding.

Chapter IV contrasts the "healing ways" of the folk medicine of many Spanish-speaking people with the scientific medicine of the Anglos emphasizing the active participation of the patient and his family when the person who administers the remedy

is a midwife, a healer, a dispenser of herbs, a witch, or one who is able to thwart the evil powers of the "brujas." To the closely knit family which extends to aunts, uncles, and cousins, the cold impersonal scientific medicine of the Anglos is untenable. To this cultural group "a hospital is a place where people go to die," and they can cite cases to prove it! Folk medicine, like scientific medicine, undoubtedly derives much of its prestige and authority from the fact that the majority of sick persons get well regardless of what is done. According to the culture of the Spanish-speaking group the folk medicine which has been handed down from generation to generation through the centuries has withstood the test of time and *must* be proven wrong.

Chapter V is devoted to efforts which have been made to bridge the gap between the two cultures, and to provide more and better health services for the Spanish-speaking population of the Southwest. Two cooperative health associations, one in Taos County, New Mexico, the other in Costilla County, Colorado, failed because the people were not culturally prepared for them. They do not subscribe to an insurance plan; if no one in the family has become ill, they consider it a waste of money. The planning and organization of the programs were for the most part done by individuals with whom the people could not identify. To be successful, the knowledge of auxiliary personnel and local groups must be utilized. Allocating duties, which can be performed without harm, to lay healers is valuable for winning the confidence of the community and facilitating the transition from a heavy reliance on traditional folk practices to the adoption of Anglo medical ways. The team approach is necessary. The author's interpretation of the team is excellent. "A group of people can accomplish more working together as a team than they can separately. But, it must be remembered, a team is more than an aggregation of individuals working on a common task. It is a cooperative endeavor based on shared interests, complementary abilities and skills, mutual respect for each other's roles, and common goals. It functions well only if its members have high morale, only if each has a sense of the importance of his contribution and its place in the whole endeavor. But these do not come about by chance. Somebody has to develop and nourish them. Somebody has to be concerned about them. On a health team that somebody is the physician." In summary, ingenuity, flexibility, and knowledge of both cultures are necessary if Anglos are to develop a health plan which, without sacrificing "rightness" from the Anglo point of view, will serve to draw in and give satisfaction to those on the other side of the cultural fence. The strong family relationship should be utilized and not undervalued by the Anglo medical profession.

Chapter VI points out that understanding of man as a social being is a requirement for good practice of medicine, and that the curriculum of premedical and medical education now includes social sciences. Also it is illustrated that principles applicable to the Spanish-speaking people of the Southwest may well be used for all groups in the art of practicing medicine making the modifications necessary for the particular group in question.

The notes on each chapter which clarify certain situations, or give references are excellent. Appendix A on "Dermographic Characteristics of the Spanish-Speaking Population of the Southwest," and appendix B entitled "A Note on Witches and Witchcraft," are both very informative.

This is an excellent book. Any one associated with the practice of medicine will profit by reading it.

Textbook of the Rheumatic Diseases. *Edited by W. S. C. Copeman, M.D., F.R.C.P., O.B.E. Senior Physician, Arthur Stanley Institute for Rheumatic Diseases, Middlesex Hospital; Physician in Charge of Department of Rheumatic Diseases, West London Hospital; Chairman, Empire Rheumatism Council; Late President of European League Against Rheumatism. Cloth; price $11.00. Pp. 719; Illus. Williams & Wilkins Co., Baltimore, Md. 1955.*

This textbook aptly titled, edited by Dr. Copeman, boasts some 25 contributors. It is to be noted that this book is the work of a prominent group of Englishmen and appears to be England's answer to *Comroes Arthritis*, by Hollander et al. As such, in the opinion of this reviewer, it takes second place. While the material is adequately presented, it lacks the chapter summaries and the format that makes it possible for the physical therapist to find the information he wants without searching through a volume of works. In all fairness it should be said that this book is well written. The chapter on Physical Medicine is very good, but some of the opinions given are open to debate e.g. Chapter XXIII (page 603), "It should be realized that muscle in constant spasm wastes with great rapidity." This reviewer would call attention to spastic paraplegia as opposed to flaccid paraplegia. The difference in muscle bulk between these two groups would tend to refute this statement. Again (page 605) referring to galvanism and ionization, "Nowadays, indeed the only recognized indication for plain galvanism is in the treatment of peripheral nerve injuries." The average American physical therapist can draw his own conclusions as to the validity of that opinion.

As mentioned before, the book is well written, printed on glossy paper, but should not replace in physical therapy libraries current books on arthritis printed in the United States. A chapter dedicated to the psychiatric aspects of rheumatic diseases is refreshing and worth reading as are the social and industrial problems of the arthritic but in my opinion this book would be of more value to medical students than physical therapists.

The reviews here published have been prepared by competent authorities and do not represent the opinions of the American Physical Therapy Association.

For "Our Book Reviewers for January" see page 88

What's New . . . . . .

10. New "Walk-Off" Table

Several types of adjustable treatment tables are offered which have practical features such as adjustments of height, for standing or sitting position and include useful attachments such as foot board, restrainer straps and cervical bar for body traction. A new home model "walk-off" table has just been added to the line. LaBerne Manufacturing Company.

20. Extension Head Halter

Extension head halter, quickly hung from any door. Made of white double coutil, fleece lined. Buckle adjustments permit fitting to any head size. Halter comes complete with pulley system, doortop support, spreader bar and weight bag. The F. A. Ritter Company.

30. Orthopedic Cushioning Material

Vinylaire, a new orthopedic cushioning material has been developed and improved for orthopedic, prosthetic, surgical, and hospital use. Manufacturer says it is free of toxicity, is water repellent, may be washed, sterilized with a cold chemical solution, and is flame and cold resistant. Can be used as a cushioning substance for patients compelled to wear orthopedic appliances. Reynolds Industries.

For more information on items write to The Physical Therapy Review, 1790 Broadway, New York 19, N. Y.

New items which may be of interest to physical therapists will be mentioned in these pages each month. The accompanying explanations are made by the manufacturers and have not been investigated by the *Physical Therapy Review*.

40. Magi-Clay

This new plastolene will not stain hands or clothing yet will adhere to any surface for painting with clay. The finished painting is a three-dimensional picture in colors. The manufacturer states that this exercising material is being used in supportive treatment of disabilities involving the fingers, hands, wrists, or forearms, as an aid in developing strength and coordination and for increasing range of motion. Self Ease Units, Inc.

Our Book Reviewers for January

Bessie B. Burgemeister, Ph.D., Research Assistant in Neurology, Columbia University, New York, N. Y.

Ruby Decker, Technical Director, Physical Therapy, The University of Texas Medical Branch, Galveston, Texas.

Emil D. W. Hauser, M.D., Associate Professor Orthopedic Surgery, Northwestern University, Chicago, Ill.

Susanne Hirt, Technical Director of Physical Therapy, Medical College of Virginia, Richmond, Virginia.

Donald E. Kamholtz, Physical Therapist, Cattaraugus County Department of Health, Salamanca, New York.

Frederick E. Vultee, Captain, Medical Corps, USA, Physical Medicine Service, Walter Reed Army Hospital, Walter Reed Army Medical Center, Washington 12, D. C.

Classified WANT-ADS

QUALIFIED PHYSICAL THERAPIST. New dept., progressive general hospital. Open now. Liberal policies, excellent salary according to qualifications. Forty-hour week, 2 weeks' vacation, 6 national holidays, sick leave. Mild climate, vacation area. Contact Sister Superior, St. Mary's Hospital, Astoria, Ore.

PHYSICAL THERAPISTS. 650-bed hospital in central California. Good starting salary; 40-hour week; liberal vacation, holiday and sick leave plan. Apply Personnel Office, 510 East Market St., Stockton, California.

EXPERIENCED physical therapist to initiate home extension rehabilitation program in cooperation with Duke Hospital and Memorial Hospital of the University of North Carolina. Opportunity for teaching. Write: Mrs. Eleanore Malone, N. C. Society for Crippled Children, Box 839, Chapel Hill, N. C.

PHYSICAL THERAPIST: Attractive salary with regular increases, 40-hour week, to work in a large county hospital. Liberal retirement, paid sick leave and vacations. Automatic annual salary increases. Must be citizen of U. S. and have completed an approved course in physical therapy. Contact: Wayne County Civil Service Commission, 628 City-County Building, Detroit 26, Michigan.

WORK IN SOUTHERN CALIFORNIA: Physical therapists needed to staff new Rehabilitation Service at Rancho Los Amigos. All aspects of rehabilitation of all age levels including post-acute and convalescent care of respirator patients, general medical, and orthopedic disabilities and all aspects of bracing and prosthetics. In-service training program under direction of physical therapy instructor. Five-day 40-hr. week, holidays, sick leave, vacation privileges, retirement benefits with Civil Service rights. New building and most modern equipment available. Vacancies include staff therapists, senior therapists, and instructors. Quarters available, laundry furnished. Good beginning salary, annual increases. Write: Personnel Director, Rancho Los Amigos, Hondo, California.

STAFF THERAPISTS — Westchester County; salary based on community surveys; no exam required; complete professional supervision; progressive personnel practices. Contact Personnel Office, County Office Building; White Plains, N. Y.

PHYSICAL THERAPIST WANTED: To take charge of physical therapy department in 125-bed general hospital. Good salary with regular increases, paid vacation, holidays and sick leave. Contact Administrator, De Paul Hospital, Cheyenne, Wyoming.

QUALIFIED PHYSICAL THERAPIST (woman) for staff position in 350-bed general hospital. Must be a member of APTA and American Registry. Good salary — dependent on qualifications and experience. St. Rita's Hospital, Lima, Ohio.

STAFF THERAPIST needed for a new 60-bed chronic disease hospital. Well equipped dept. for complete physical therapy program. Salary commensurate with experience and qualifications. For further information write Loren Quam, RPT, Sheyenne Memorial Hospital for Chronic Disease, Box 307, Valley City, N. D.

WANTED: QUALIFIED PHYSICAL THERAPIST to start Home Service Program (Jan. 1, 1956) with an Outpatient Physical Medicine, Rehabilitation Center. Good personnel policies. Salary dependent upon experience. Write: Gloria J. Fitzpatrick, RPT, Director, Ingham County Curative Workshop, 615 North Capitol, Lansing, Michigan.

IOWA METHODIST HOSPITAL, Des Moines, Iowa, needs qualified physical therapist. Hospital has 400 beds, including 100-bed Raymond Blank Memorial for Children. Postpolio cases and in- and outpatient work. Competent professional staff and assistants, excellent working relationships. Apply: Bruce D. Root, Personnel, Director.

Classified WANT-ADS

WANTED: PHYSICAL THERAPIST for cerebral palsy and polio children. Salary commensurate with experience, 5-day week, liberal vacation, holiday and sick leave. Apply: San Antonio Cerebral Palsy and Crippled Children's Center, 305 Austin St., San Antonio, Texas.

QUALIFIED PHYSICAL THERAPIST, male or female, for expanding department in air conditioned hospital. Good salary. Ideal working conditions. Advancement assured. Apply to Alpha C. Solley, Chief Physical Therapist, Mobile Infirmary, Mobile, Alabama.

Opening in CEREBRAL PALSY SCHOOL and Treatment Center in new building. Very good salary and liberal personnel policies. Experience in cerebral palsy desirable. Write: Mrs. D. M. Brown, 804 Dover Road, Greensboro, N. C.

QUALIFIED PHYSICAL THERAPISTS for the
Institute of Physical Medicine and Rehabilitation
Excellent opportunity for experience
Free tuition plan, univ. courses
Apply personnel: 420 East 34 Street, N. Y. C., N. Y.
NEW YORK UNIV. BELLEVUE MEDICAL CENTER

PHYSICAL THERAPIST for expanding department in new 240-bed hospital. Fully accredited. General work with in- and outpatients referred by medical staff. Write Personnel Director, Parkview Memorial Hospital, 2200 Randalia, Fort Wayne, Indiana.

WANTED: Qualified physical therapist for staff position in a 650-bed University teaching hospital including 30-bed rehabilitation center. Two-week vacation, six paid holidays, sick leave benefits. Attractive starting salary. Experience not necessary. Write Harold N. New, M.D., Creighton Memorial St. Joseph's Hospital, Omaha, Nebraska.

QUALIFIED PHYSICAL THERAPISTS (female). Either experienced or inexperienced therapist. Rapidly growing Rehabilitation Center, good opportunity for promotion. Salary schedule designed to attract the best. Five-day week, Monday through Friday, 8:30 a.m. to 4:30 p.m. Holidays off, paid vacation and sick leave. Social security, Workmen's Compensation, Blue Cross and Blue Shield. Contact Roy E. Patton, Executive Director, Crossroads Rehabilitation Center, 3001 North New Jersey Street, Indianapolis 5, Indiana.

PHYSICAL THERAPIST: In Hospital-School for rehabilitation of children with orthopedic handicaps. Complete interesting program. Good salary, merit increases. Annual paid vacation, sick leave, excellent retirement plan. Write Vera E. Dennis, Director of Physical Therapy, Illinois Children's Hospital-School, 2551 N. Clark, Chicago 14, Ill.

WANTED: PHYSICAL THERAPIST to work in well equipped cerebral palsy center: liberal vacation and sick leave; under state merit system. Write W. D. White, Ed.D., Superintendent, Rainier State School, Buckley, Washington.

MEXICO CITY: Physical therapist for supervision rehabilitation services American British Cowdray Hospital. Services include modern well equipped Physical and Occupational Therapy Depts., Brace Shop, and Rehabilitation Nursing Unit. Basic Spanish advantageous but not essential. Address replies to Barbara Adams, Dept. of Physical Medicine, A.B.C. Hospital Victor Hugo 79 Mexico 5, D. F.

IMMEDIATE placement for qualified registered physical therapists (male or female) for rapidly expanding physical medicine and rehabilitation institute serving two hospitals, total 1,000 general medical and surgical beds in largest centrally located industrial center in Illinois. Six paid holidays, two weeks' paid annual vacation, normal work week of 40 hours, sick leave accumulative, participating insurance program. Write: Administrator, Institute of Physical Medicine and Rehabilitation, 619 North Glen Oak Avenue, Peoria, Illinois.

Classified WANT-ADS

RATES

The rate per insertion is 75c per line. Typewrite your advertisement carefully and count 50 characters and spaces per line.

ALL WANT-ADS MUST BE PAID FOR IN ADVANCE. Make checks or money orders payable to the American Physical Therapy Association.

Closing date for copy and cancellations is two months preceding publication date.

Institutions or physical therapists who do not wish their identity known may arrange for Blind Ad Code No. All such want-ads must include the following which will be counted as 2 lines:

Address repies to ..... care of **The Physical Therapy Review, 1790 Broadway, New York 19, N. Y.**

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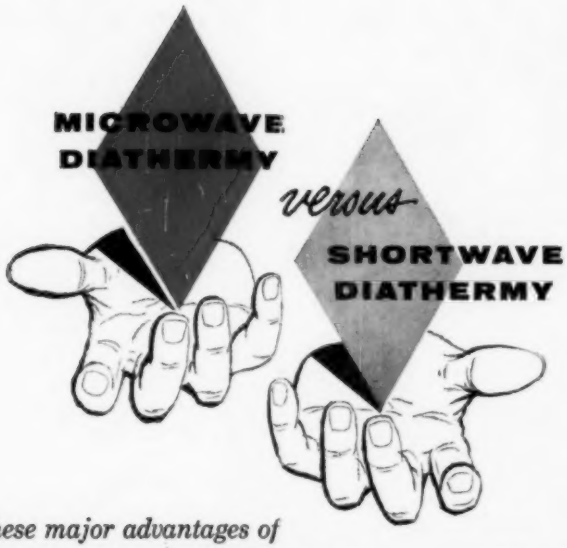
It is understood and agreed that the publisher shall have the right to reject or change the wording of any advertisement which in the opinion of the Editorial Board shall not be in agreement with the ethical standing of this publication.



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